THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1803.] LONDON, NOVEMBER 30, 1897. [49TH YEAR. PRICE 6d.

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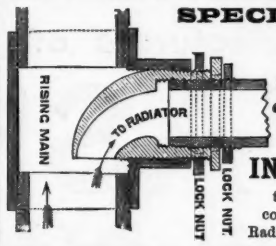

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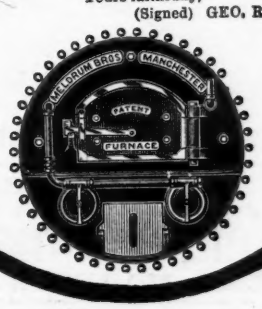

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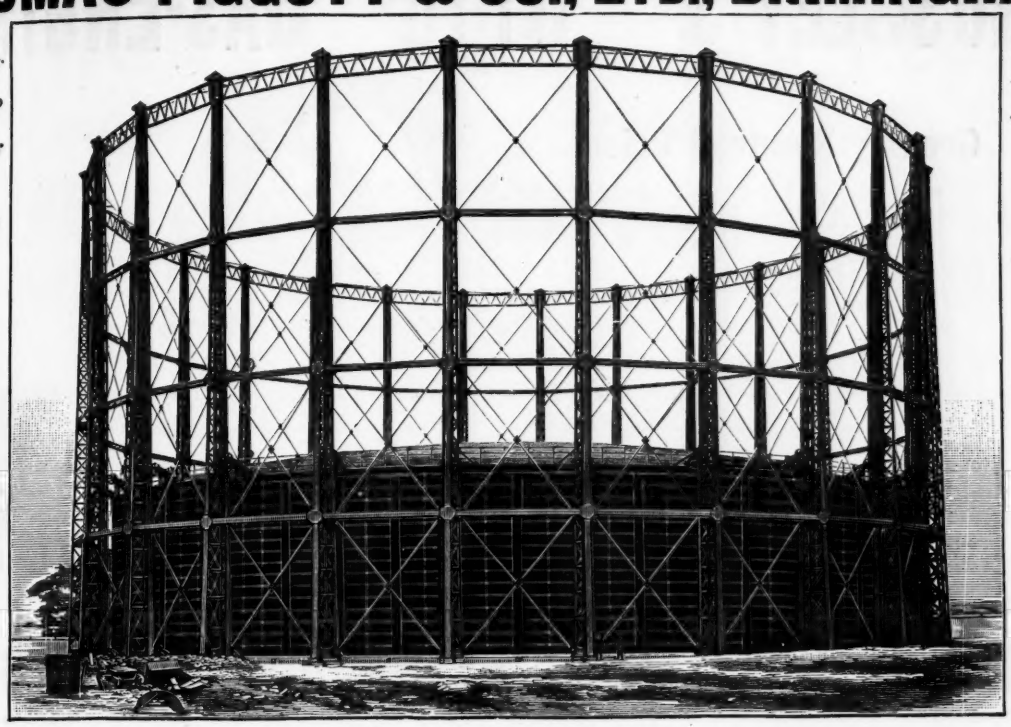

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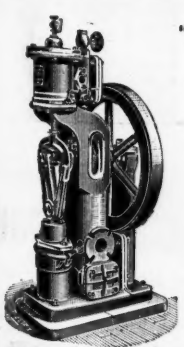

Fig. 705. "SINGLE RAM" STEAM-PUMP.

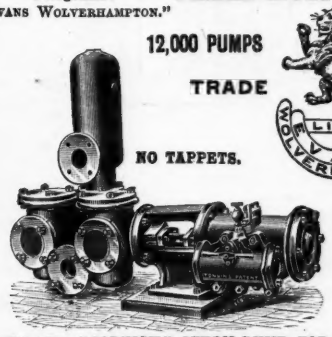

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

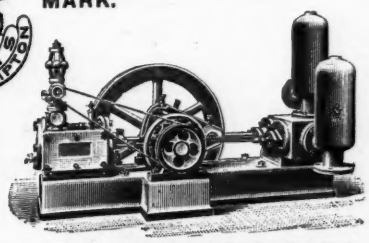

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

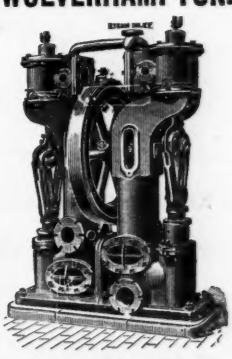

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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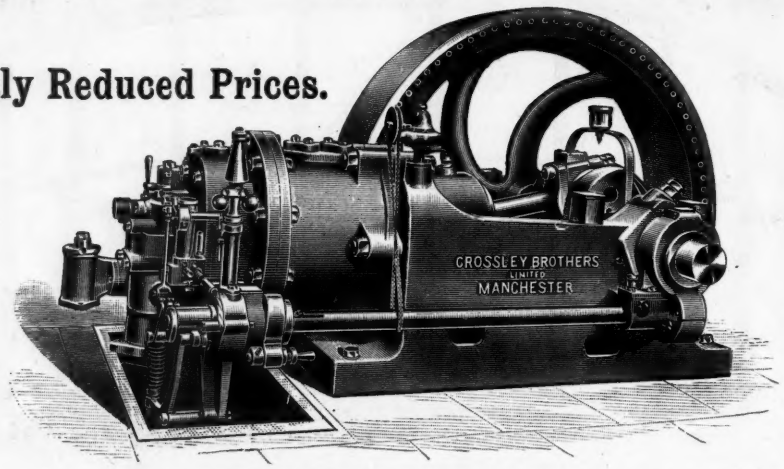

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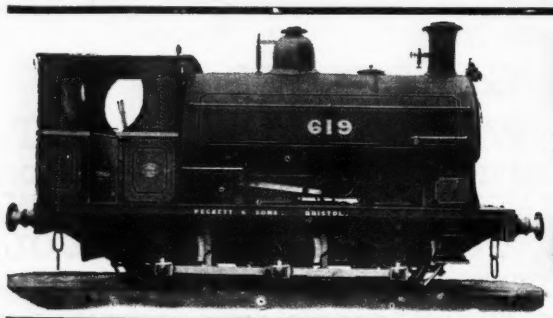

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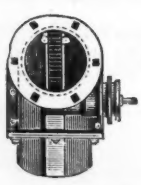

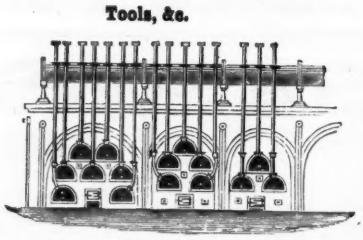

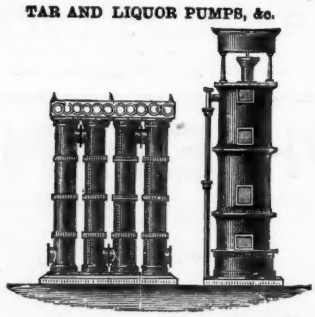

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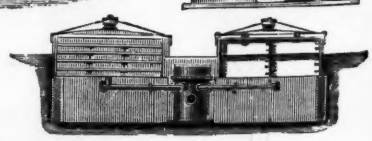

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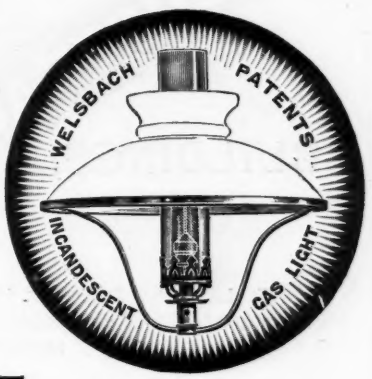

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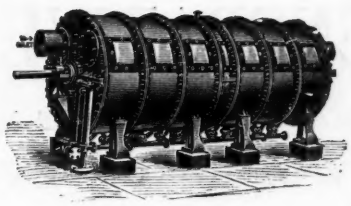

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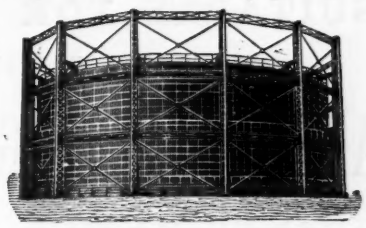

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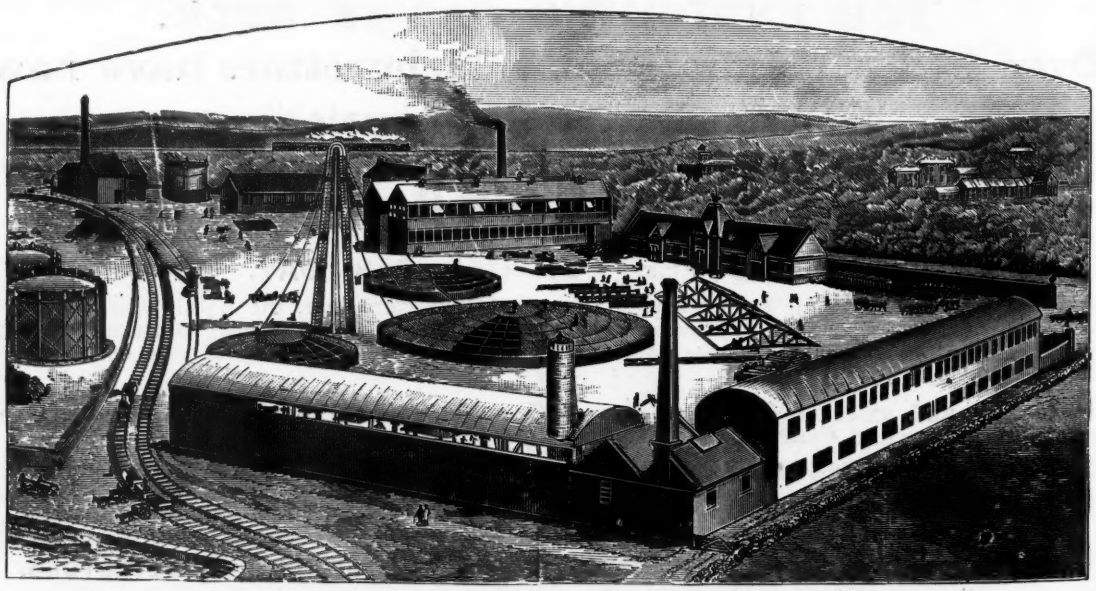

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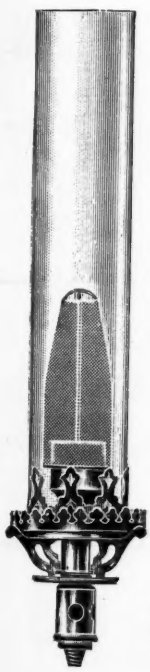

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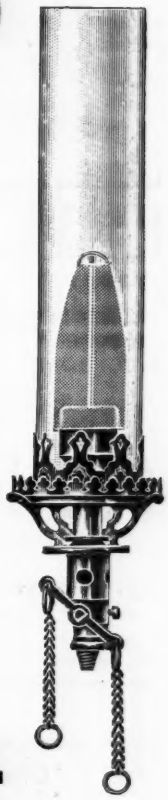

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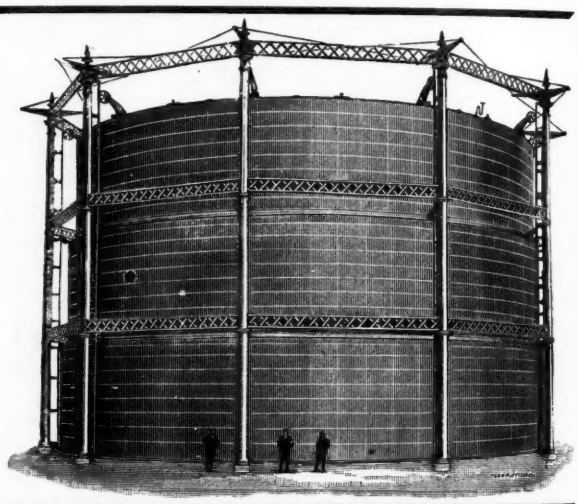

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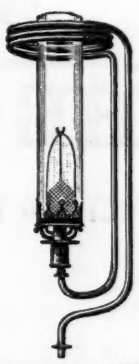

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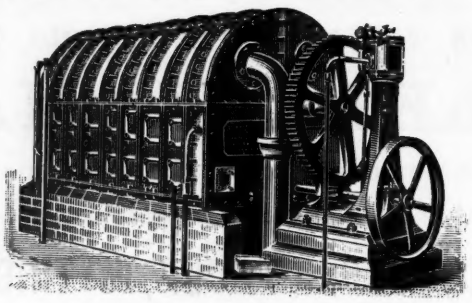

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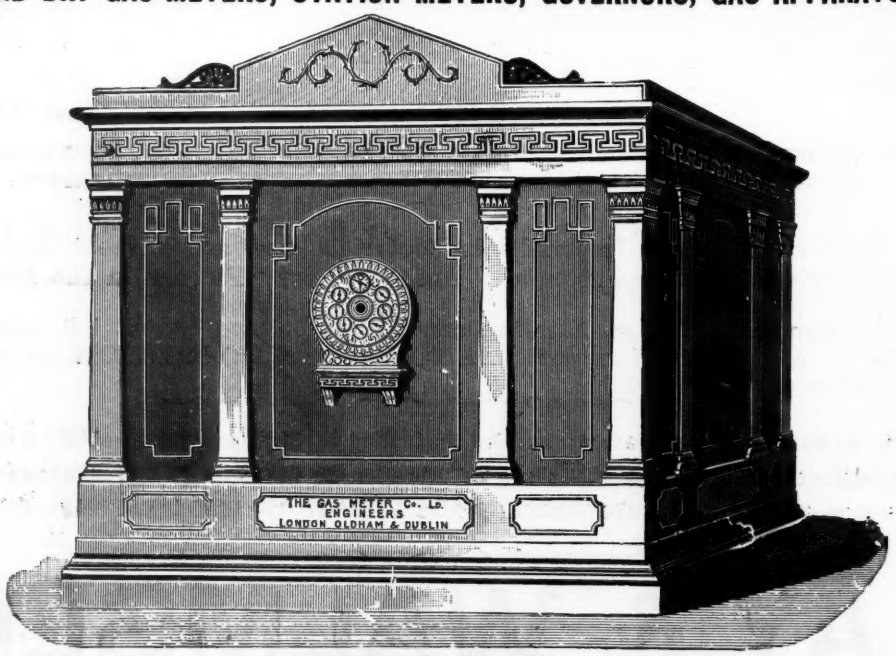

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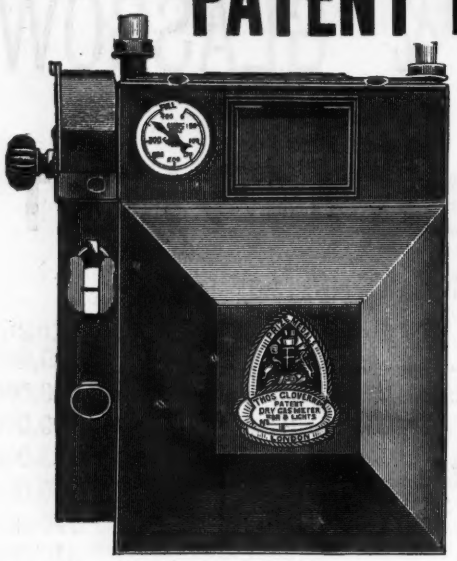

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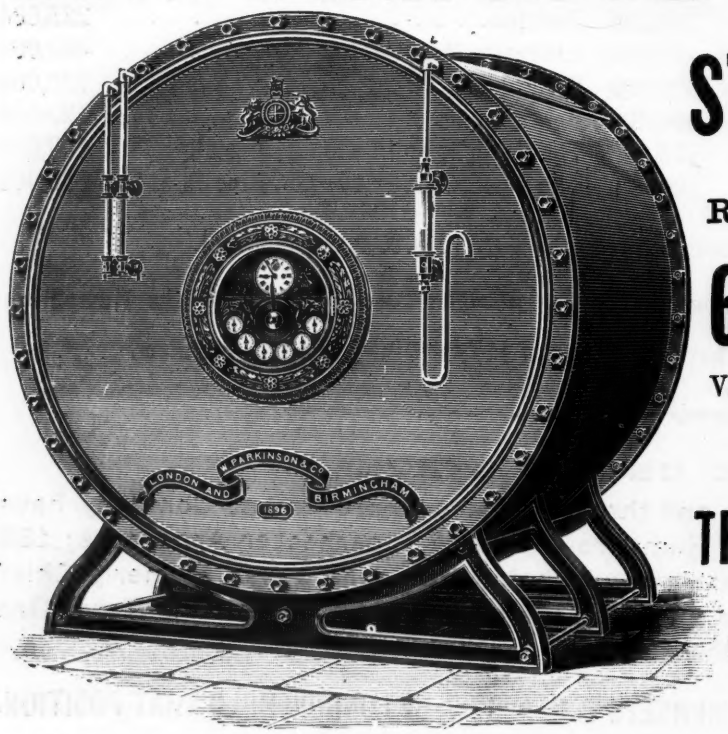

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EDITORIAL NOTES.

The Parliamentary Notices.

IN another column of the present issue of the "JOURNAL" will be found our customary abstract of the parliamentary notices of Gas Bills and Provisional Orders for the ensuing session. The list is a long one, and contains some highly important proposals. We have already noticed the proposed Bill of The Gaslight and Coke Company. There are no other Metropolitan Gas Companies in Parliament this time; but the Tottenham and Edmonton and the Enfield Companies, among the Suburban undertakings, are in the list. Edinburgh, Plymouth, Southampton, York, and Gloucester are among the largest cities and towns proceeding for further parliamentary powers in regard to gas supply. St. Anne's-on-the-Sea is to the fore again with an incorporating Bill. The Thanet Gas Company will have an interesting Bill, inasmuch as they propose to take over and work the electric lighting powers of the Margate Corporation. Southend-on-Sea is in similar case. Waterford is going for a capital consolidation scheme, an interesting feature of which is that the new stock created is to be offered first to the consumers. This is not an absolutely novel idea, inasmuch as the last South Metropolitan Bill but one proposed the same thing, and it was objected to by the London County Council. There is a fair crop of notices for Provisional Orders—Board of Trade and Local Government Board; so that, taking them altogether, the legislative prospects of the coming session, so far as gas supply is concerned, are quite up to the average standard of activity. Judged with reference to the amount of capital involved, the business will also be exceptionally heavy.

A Great Fire in London.

LAST Friday week there was an outbreak of fire in London which, had it occurred in any other city, would probably have been regarded as worthy of ranking in history as an event of capital importance. So huge is London, however, so diffused its vitality, that while the flames were actually licking up a whole settlement of traders and workers engaged in a familiar department of London business, people a few streets away knew nothing of it, and only learnt what had happened by the contents bills of the evening newspapers thrust in their faces on the way home. It is recorded in histories of the fall of Nineveh that, owing to the vastness of the city, the defenders and assailants at the centre had finished their work for days before the residents in the more remote quarters knew what had been going on. They had no newspapers in Nineveh. Londoners were informed of the outbreak a couple of hours after it occurred. The latest great fire of London was compared in the next day's papers with the Great Fire that followed the Plague. Also, the damage was reported as amounting to fifteen millions sterling or thereabouts; and the cause of the fire was confidently stated to be an explosion of gas. This indicates at once the strength and the weakness of the Daily Press. London itself may be like a mass of civic protoplasm, so that no part of it has any sensitive connection with the remainder of the formless body; but the newspapers are the nervous system by which intelligence of what is going on anywhere is communicated to all parts of the mass. When things are dull, the evening newspapers undertake to keep their readers posted in all the small events of the hour; and the arrest of a supposed burglar is made as much of as the collapse of a Ministry at another time. This is very satisfactory; and readers of these chronicles may rest assured that, whatever else their news may be, it is at least honest. Their conductors do not create the rumours they record. But when it comes to comment and explanation, the honest British newspaper is apt to be quite as credulous and uncritical as any old village gossip.

The fire now in question had not been twenty-four hours old before an enormous mass of fable respecting it was being circulated with all the energy and enterprise for which the newspaper press of the country is so justly renowned. It was gas that did it and kept it going; there was no water; the first fire-engine did not reach the scene until twenty minutes after the outbreak; they manage these things so much better in New York or Berlin; the fire offices will be ruined—and so forth. Of course, a few hours later saw all this marvellous imagery

dispelled; but it is impossible to think very highly of the judgment or the sense of public duty of those who repeated if they did not invent it. The facts are simple enough, and unfortunately only too intelligible. The region, which anybody leaving the Aldersgate Street Station of the Metropolitan Railway would have to traverse on his direct way towards the centre of the City, is given over to the manufacture and handling of articles in fur and feathers—hats, toys, the flimsy goods one sees in drapers' shops, and the like. The streets, originally narrow, have been rebuilt, after many fires, with lofty structures not essentially more substantial for being composed mainly of iron girders, plate glass, and just as little brickwork as possible. They are not flimsy, these buildings, nor are they made of combustible materials to any blameworthy extent; but they simply collapse when their inflammable contents once get well alight. And in them there is normally a hive of busy operators, doing all sorts of things with shellac varnish, spirit gum, and naphtha; with hot irons at hand, and gas burners and stoves flaring all day long in apartments littered with paper shavings, and crowded with persons and goods from floor to ceiling, from door to window. Destruction by fire is, and must be, the ordinary end of such places. Sometimes they burn by the half dozen; more rarely, as in this instance, by the score and hundred.

Always, whatever the extent of the fire damage, the way of it is the same. It may have been gas that started the latest conflagration, or it may have been a dropped match. The official report says: "Cause of fire un-"known;" and there the matter must be permitted to rest until the inevitable inquest. Some wiseacre wanted to make out at the meeting of the London County Council last week that if the district had been lighted by electricity the fire would not have taken place, or been so fierce and far-reaching. Perhaps, if there had been no gas, no fires, no matches, no oil, spirit, or candles, in the region, things might have been different. But then the quarter would not have been a manufacturing one, giving occupation to thousands of workpeople, and filling its own proper place in the world. Speculations of this nature are certainly the merest trifling.

The Meeting of the Manchester District Institution.

The Manchester District Institution of Gas Engineers held a meeting on Saturday at Bradford, under the presidency of Mr. Robert Porter, of Elland. Mr. E. A. Harman, of Huddersfield, read a chatty paper on "Sul-"phate of Ammonia," dealing chiefly with the manufacture and disposal of the product. But the paper contains some valuable points. The author is inclined to favour centralization. He thinks a "central authority" for advising sulphate makers would be desirable; and he would like, moreover, to see a National Gas Industry Institution in London, where all the technical society meetings could be held. This centre would also be a permanent exhibition of novelties in apparatus, to which specimens could be sent for inspection. The author evidently had the United Service Institution in his mind when framing this suggestion. The idea is obviously good; but it is to be feared that it will not be realized in our time. Mr. S. S. Mellor, the Hon. Secretary of the Institution, described Billington's system for the removal of scurf from retorts by the air-blast, which is claimed to give complete satisfaction. The remaining contribution to the business of the meeting was a succinct description, by Mr. A. H. Gibbings, of the Bradford Corporation electric lighting plant. This is the oldest, as it is one of the most prosperous, public electric lighting undertakings in the kingdom. It is also one of the most—perhaps the most liberally administered of municipal concerns of the kind; and this doubtless has something to do with the result. The district, however, is a very desirable one.

The Week's Work of the President of the Board of Trade.

The President of the Board of Trade has been a very busy and responsible man of late. So much should be said, indeed, of any occupant of the office actually filled by Mr. Ritchie; but the last few weeks have been exceptionally full of anxious business for the head of this important Department of the Government. The laudable efforts that have been made by the President and his chief assistants to get into a room together the parties to the dispute in the engineering trade, represent much pondering and secret consultation. Moreover, in the course of these preliminaries a good deal of pointed criticism from without has been directed upon the newest branch of the Department—the "Labour" side which was created so hopefully by the late Government. It cannot have been pleasant for Mr. Ritchie to be told that this branch was so packed with old professional Trade Unionists as to be devoid, in public estimation, of that impartiality which must be the first qualification of those who would successfully interpose in industrial quarrels. This is the fact, and it has been from the beginning of the new Department; but it is not surprising now to learn by rumour that things in this regard are to be different in future. If the Government have learnt that it is not necessary, in the true interests of "Labour," to reward old agitators with snug berths at comfortable salaries, something will have been gained. To give the late Administration all credit for good intentions, it is nevertheless not to be ignored that they fell into the vulgar error of taking the professional Trade Unionists at their own valuation as authorities on the needs and circumstances of the labouring classes of the country. How little truth there is in this delusion, the Trade Union leaders who are not favoured with Government posts have been doing their best to demonstrate ever since the appointments. Another proof of this was given last week, when the annual deputation of the Trade Union Congress, 176 strong, waited upon Mr. Ritchie at Whitehall. This is the deputation that even the Congress itself was half inclined to give up as a useless expense and trouble. But, of course, the spokesmen were disinclined to let slip the chance of advertising themselves; and so the pilgrimage has taken its accustomed way once more. We should be very loth to think that any class organization of British subjects could not have access to the Queen's Ministers for the purpose of making representations to the Government in regard to their agreed wants. But these Trade Union Congress deputations have lost the pretence of utility. All that can be advanced on such occasions is known, and the spectacle of a busy statesman and a crowd of delegates standing up to inflict perfunctory addresses upon each other is not a creditable display for a practical people to make regularly. Almost the only request preferred "with "intention" by the deputation to Mr. Ritchie was one of "a great extension of the Labour Department of the Board "of Trade." One can easily understand the attractiveness of this idea.

One of Mr. Ritchie's tasks for the week was to explain more fully the meaning of Lord Salisbury's recent criticism of the methods and performances of the London County Council. This he did in the course of an address to his own constituents at Croydon. Lord Salisbury called the County Council a little Parliament; and the late Chairman of the Council, Sir Arthur Arnold, even when answering the Premier's observations, admitted the "soft impeachment." But this was not the idea of anybody concerned in, or responsible for, the legislation of which the present County Council was the outcome. It was the sole intention of the Government to create real municipal institutions for London, with a central Council for doing such business as must necessarily fall to the lot of a centralized authority. But unfortunately schemes of Government do not always get into the groove they were designed to fit. A number of ardent spirits, scarcely one of whom had had any previous experience of the work of local self-government, got into the London County Council, and they forthwith began to assume for this necessarily makeshift body the status of a Municipal Corporation for all London. As we have invariably maintained, the Council is not a Municipal Corporation, and it was never meant to be anything of the kind. The unhappy twist given to the "Progressive" politics of the first Council by those who dominated this callow organization has remained. The only question worth discussing in this connection is how the defects of the Council are to be remedied. The opinion of the Government is that the salvation of London may be found in the creation of more dignified and powerful District Authorities. It is suggested that Westminster, Marylebone, Chelsea, Kensington, and other well-defined neighbourhoods, might, if they were municipalities, attract into their local councils men who do not care to take a seat upon a Vestry, and have no time for the academic debates of the London County Council. It may be so. Nobody can positively say how the experiment would work out; but it is at any rate worth trying. Something ought to be

done; and this is the only thing that it seems possible to do. Such a solution of the problem would at least render it beyond the power of the County Council to arrogate to itself the right—already disputed by other Metropolitan Authorities—to a disposing voice in questions of gas and water supply. The Council might hope to override the wishes of a mere Vestry or District Board of Works; but it would have to pay greater respect to the representations of a Mayor and Corporation.

Mr. Chamberlain also mentioned the case of the London County Council in his annual address to his constituents. It was a bold touch to try and interest the voters of West Birmingham in the municipal concerns of the Metropolis. But the venture was successful; and the great assembly followed the speaker's references to the needs of Islington and other London districts as patiently and intelligently as they could have listened to observations upon West Bromwich. It was a singular testimony to the magnetism of the statesman and the universal interest of his subject—the cause of good government. Birmingham is well governed—at least, it is governed as well as Birmingham men know how; and they are willing to see the Metropolis similarly treated.

The Engineering Strike and Conference.

THE news of the week concerning the engineering strike centres in the conference which began business on Wednesday with fourteen delegates on each side, as arranged. The affiliated Trade Unions had some difficulty in settling upon the constitution of their team, owing to the circumstance that the Executive of the A.S.E. wished to have ten of their own men included in it. To this it was objected that so great a preponderance of A.S.E. members would shut out seven of the twelve Unions which had been dragged into the strike by the former Society. Eventually the team was made up of nine men of the A.S.E., three delegates from the Joint Committee, one Steam-Engine Maker, and one United Machine Worker. Colonel Dyer was Chairman on the employers' side; and Mr. Sellicks on that of the men. After the first day's deliberations had terminated, it was officially reported that the subject under discussion had been the freedom of employers in the management of works. The employers were prepared with a definition of the meaning of this condition, in the shape of an agreed resolution, which was handed to the other side for consideration. It was met with a counter-resolution, which was discussed; and afterwards several amended proposals were handed backwards and forwards between the parties. Three days were occupied in these discussions; and after the third day it was announced that a decided step towards agreement had been taken. This was good news, for the question of shop control is notoriously the very kernel of the dispute. Before the conference met, the positions of the parties relatively to this point seemed irreconcilable. After three days' talking over the matter, an agreement was concluded on the following basis: "The Federated Employers, while disavowing "any intention of interfering with the proper functions of "Trade Unions, will admit no interference with the "management of their business, and reserve to themselves "the right to introduce into any federated workshop, at "the option of the employer concerned, any condition of "labour under which any members of the Trade Unions "here represented were working at the commencement of "the dispute in any of the workshops of the Federated "Employers." After making a further proposal, which the employers declined to entertain, the men accepted this resolution as a basis for the discussion of details.

For the present it is sufficient to mark what this provisional agreement means. It secures practically all that the masters asked for, by a levelling-up process which destroys at a blow all the irritating distinctions between the practice of different shops which the A.S.E. has been diligently creating for years, and to all intents and purposes relegates the Union to its natural position. Of course, there may be difficulties in places in carrying the principle into effect. The A.S.E. have interfered in shop management so incessantly—sometimes merely to assert the position of the Society as entitled to be consulted in such matters—that it will be hard for those who have enjoyed the exercise of this petty tyranny to learn to efface themselves. They will have to digest the lesson, however, if the settlement is to be a real and lasting one.

There is yet much for the conference to do. Expelling a tyrant from power is comparatively easy. It is another thing to keep the spirit of tyranny at bay. The employers will have to remember the familiar American saying: "Eternal vigilance is the price of liberty," and act upon it more consistently than has the nation to which the caution was addressed. The prime necessity is to prevent the official element of a Trade Union from blocking the course of industrial progress in pursuance of those crude notions respecting the restriction of output, and the like, which have had so pernicious an operation in the past. The Trade Union must no longer be the fetish to which human sacrifices are made at the will of a paid official. Apprenticeship must be freed; the path upward of the smart young "labourer" must be thrown open; ability, integrity, and industry must be restored to their natural position as marks of the good workman. Labour-saving machines and methods; profit-sharing, and other aids to the deliverance of the journeyman from bondage to his daily pay—anything and everything tending to the elevation of the workmen and the advancement of the trade in which they are employed, must have full and free play, whether the shop delegate or the Union secretary conceives it to be to their advantage or not. If an active sense of this necessity is borne in upon the future A.S.E. Executive, and is mirrored in the official reports of the Society after this "unpleasantness" is over, there will be some hope for the organization. But the signs of the new spirit will be curiously looked for.

WATER AND SANITARY AFFAIRS.

THE Royal Commissioners on the London Water Supply have held their first sitting; and Mr. H. L. Cripps, the Parliamentary Agent of the London County Council, while professedly appearing as a witness, has made the opening speech—declaring himself to be fully acquainted with the proceedings and views of the Council upon the subject of the water supply of the Metropolis. What Mr. Cripps had to say was subject to a very clear forecast by Lord Llandaff, the Chairman of the Commission, who said he had gathered that the Council were in favour of solving the question of the Metropolitan Water Supply by the purchase of the existing undertakings. Mr. Cripps was constrained to admit the accuracy of this inference, and then proceeded to give a kind of historical sketch of the subject. He described the Council as debating the three modes of dealing with the Water Question which had been set forth by Sir William Harcourt's Committee. These methods were respectively competition, regulation, purchase. It is interesting to find Mr. Cripps saying that, after consideration, the Council decided that the introduction of an independent water supply, which must be in competition with the several existing Water Companies, was open to so much difficulty that it was better to set this suggestion aside. Perhaps it is fair to consider that the Welsh scheme is simply a lever to enforce purchase. With respect to regulation, the County Council are described as of opinion that such an expedient would not afford a final settlement. Purchase, therefore, is looked upon as the only available resource; and Mr. Cripps endeavoured to show in his statement that the clear policy of Parliament for years past has been to favour the transfer of water undertakings to local authorities. However true this may be in regard to the Provinces, it is not so apparent with respect to London. Mr. Cripps has to deal with the fact that the Purchase Bills of the County Council have been distinctly thrown overboard by Parliament; very clearly showing that the Legislature has not favoured the idea of putting the County Council in the place of the Water Companies. We may admit that Parliamentary Committees have of late been careful not to give additional powers for prolonged periods to the Companies; but there is no proof that this is designed to prepare the way for the County Council.

Mr. Cripps succeeded in getting himself into a curious tangle by arguing that the eight Metropolitan Water Companies owed their existence to the idea of Parliament that there should be a competitive supply. At this point the Chairman asked whether the speaker suggested that Parliament could now, without unfairness to the Companies,

authorize a fresh supply to London as a whole. Mr. Cripps being compelled to admit that such a procedure would be "hardly reasonable," the Chairman astutely asked: "If "competition is to be put aside as unfair, why do you ask "us to consider it?" Mr. Cripps certainly did not retrieve his position by going on to argue that competition, had it come into operation, would have reduced the water-rates. Mr. Cripps had so much to say on this subject, that we are somewhat at a loss to understand how he can represent the Council as falling back on purchase because competition is replete with difficulty, and regulation is ineffective. Next Monday Mr. Cripps will reappear before the Commission, when perhaps he will say something about the Welsh supply; showing how this bears on the question of competition, and how it is likely to effect economy in the matter of cost. Mr. Cripps admits that a supply taken from neighbouring rivers is less expensive to procure than one derived from distant sources. What must follow if the Welsh scheme is adopted is therefore evident. It is perhaps unfortunate that the project for fetching water from Wales scarcely comes within the terms of reference prescribed to the Commission. But Mr. Cripps has himself made mention of "distant sources;" and his *penchant* for competition naturally leads that way.

Among the Bills relative to the supply of water to be brought before Parliament next year, of which a list will be found in another column, there are two which directly affect the Metropolis; and for the present we limit our remarks to these. The Bill which the Southwark and Vauxhall Company propose to introduce is in accordance with the arrangement made with Parliament in the recent session, when an Act was passed to legalize the extra draught which the Company were taking from the Thames, on the understanding that they would bring forward a Bill in the session of 1898 which should provide for a permanent settlement. The Act of 1897 is a temporary measure, and was designed to meet an emergency; the Company being thereby empowered to continue drawing 40 million gallons daily from the river in place of the 24½ million gallons which was all they were otherwise entitled to take. The choice lay between making this concession and exposing a large part of South London to the risk of a water famine; the Thames Conservancy being armed with an injunction to prevent any excess in the quantity of water taken. This injunction stands over to the coming session, awaiting the action of Parliament. We think it well to state these particulars, though they are pretty well known, for they will need to be remembered when the final settlement is being debated. The Company now ask for authority to abstract such water from the river as may be required for the purpose of fulfilling their statutory obligations. It is certain that the County Council, unless very materially changed in constitution next March, will object to any proposal which in their opinion strengthens the position of the London Water Companies. Yet the question rests exactly where it did. Either the Company must take more water than their present arrangements with the Conservators would permit, or the consumers in their district must have less water than they want. It is a vital question, and we may have confidence that Parliament will not allow it to be trifled with. The other Bill to which we have made allusion is that of the Staines Reservoirs Joint Committee, by which it is proposed to enlarge two reservoirs authorized by the Act of 1896. It looks somewhat as if this Bill, like that of the Southwark and Vauxhall Company, has been rendered necessary by the timid policy of Parliament in making it a rule to grant the Metropolitan Water Companies as little as possible. Hence from time to time something more has to be asked for; and the Companies have to take what they need by instalments, instead of being properly equipped at once. In like manner Parliament has sometimes been compelled to grant to the Companies what it had previously refused.

Acetylene Gas and Gas-Engines.—In a pamphlet which has been freely circulated in Dublin, acetylene gas has been recommended for use in engines; and the cost has been given as 2¼d. per 5 cubic feet, or £2 1s. 8d. per 1000 cubic feet. It has been urged that acetylene has greater explosive force than coal gas, in the proportion of 220 : 80—not quite 3 : 1, bulk for bulk. A correspondent has pointed out in a local paper that 3000 cubic feet of coal gas, costing in Dublin about 9s. 3d. for gas-engines, would do more work than £2 1s. 8d. worth of acetylene; and he puts the pertinent question: "Would that benefit gas-engine users?"

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1188.)

Business in the Stock Markets last week showed no increase whatever in activity; and the quiet which has settled down on them seems impossible to break. At all events, with only one more account between now and Christmas, there is not much chance of a revival on this side of the holidays; and the good time, when it comes, will come in 1898. Taking things all round, they have been fairly steady, and a few have been strong; Consols and some other of the gilt-edged class showing out especially well. But rails were flat again. Prices however, though lower, have not been very hard hit. Money was strong and in good demand both for Stock Exchange and general purposes; and the prospects we adverted to last week have been abundantly realized. Gas securities were exempt from the prevailing inaction, and were more brisk and buoyant than in the preceding week. The tendency also was decidedly favourable; the disposition towards higher prices being more pronounced. In Gaslights, the "A" sharply accentuated the recovery in value it was manifesting the week before, and was very lively all through. Opening unchanged at 312½, it began at once to make a move upward, and pushed steadily on by easy stages until it closed on Saturday with a mark of 317—the best of the week. Transactions in the secured issues were only limited in volume; but everything offered commanded good figures—the debenture issues being conspicuous in this respect. South Metropolitan gave no indication of a move, and what few transactions were done in it were at about middle figures. A little Commercial changed hands at something near top prices. The Suburban and Provincial division was extremely quiet generally; but Crystal Palace was rather busy, and the quotation advanced. Moderate business was the rule in the Continental Companies. The general characteristic was firmness; and Imperial managed to advance a point. Among the rest, Melbourne 5 per cent. bonds improved; but San Paulo had a slight fall. The Water Companies did not show much inclination to activity. But they stood very firm all round; and a few of them improved a little upon their opening prices.

The daily operations were: Business in Gas was fairly active on Monday; and the prices of pretty well everything were good. Gaslight "A" advanced 1. In Water, Lambeth tens rose 2. Tuesday was rather quieter, but every bit as firm, though the only actual advance was a rise of 1 in Melbourne 5 per cent. bonds. In Water, Kent rose 2. Activity was maintained on Wednesday; and the tendency was very good. Gaslight "A" and Imperial advanced 1 each, and Crystal Palace 1½; but San Paulo fell ½. There was a very marked lull on Thursday, every issue being very quiet; but prices still held very steady. Business was resumed on Friday with a rising tide; and Gaslight "A" rose 1 more. In Water, New River rose 2. Saturday was not very active, but was full of strength, and Gaslight "A" had another rise of 2. In Water, Southwark preference rose 2.

ELECTRIC LIGHTING MEMORANDA.

Gas Companies Applying for Electric Lighting Powers—The Original Idea—Current Development—Gas Companies in Defence of Communities.

This year's parliamentary notices exhibit a novel feature, which may be found susceptible of considerable development in the future. This is the adoption by a respectable number of gas companies of the policy of equipping themselves with electric lighting powers. The typical example in this regard is the Tottenham and Edmonton Gas Company; but there are others whose case is similar. It is hardly necessary to remind habitual readers of these columns that this policy is one that we have commended for some years. It may be as well, however, to state once more our reasons for taking this view, because it is quite possible that some of the smaller fry of touting electricians may pounce upon the notices as proof positive of the paying nature of electric lighting, always and everywhere. Members of municipal bodies trembling on the verge of an electric lighting speculation, might well misunderstand the significance of this movement on the part of the gas companies; and the inference they would draw from it by suggestion of an interested electrican, might be just the one thing needed to turn the scale in favour of going on with a venture of the same kind. "Is it likely," the suggestion would run, "that a gas company would go in for this new branch of business unless it were certain to pay? Don't let them have the chance—do it yourselves, get the profits, and keep the streets in your own hands, so far as the electric lighting service is concerned." The plausibility of this interpretation of the new departure is great and obvious; but it is not the true one, as can be easily demonstrated in a very few words.

Time was when any such action on the part of a gas company could only have borne one interpretation. When commercial electric lighting was first introduced, some gas companies thought they had a prescriptive right to proprietorship of the new light, inasmuch as organized public and private lighting was their

business. They feared that the new-comer would injure them; and they wanted to protect themselves by taking it into their own hands. This was very largely done in the United States, and in some places on the Continent; many gas companies becoming also electricity supply companies. The public did not suffer at all from this proceeding, because the gas companies who took up with electric lighting were bound to provide as good a service as could have been furnished by independent adventurers. Most of the gas companies in question, however, paid dearly for their temerity in attempting to gather unripe fruit; and hardly any of them have reason to rejoice greatly over the harvest even after all these years. There existed in some towns inducements other than the financial for the gas company to supply electric lighting. The chief of these was political; and a very conspicuous example of submission to it was by the Imperial Continental Gas Association at Vienna. In the United Kingdom, although many gas companies scrutinized their Acts of Parliament to discover in the usual clause defining the objects of the company, words that could be read as covering electricity supply, the Board of Trade put a stop to such speculation by letting it be known that gas companies would not be regarded by the department as having special claims to electric lighting facilities.

Here the matter rested for years—fortunately, perhaps, for the British gas industry, which soon found that it had plenty to do in keeping pace with the enlarged demands of the public for its own staple. Hardly had it been settled that the supposititious great gains awaiting the nascent electrical industry were not to go to the gas companies, than the golden dreams of the electrified speculators of the time were rudely dispelled; and these gains were found to have no existence in fact. Thereafter, as everybody knows, practical electric lighting became a branch of mechanical engineering; and its commercial possibilities were slowly disclosed. Now we know all about it, as men of business, and can no more be excited over the prospects of central station electric lighting than over a project for a new railway—which class of enterprise had a period of mania, too, in its day.

Electric lighting is a business that can be carried on anywhere, but not everywhere at a profit. The electric light is a luxury which some people like to indulge in; and there is no reason why they should be deprived of it, if it is to be had. In many cases, people can supply themselves with the luxury to advantage. There is a greater number, however, who cannot do this, and must therefore obtain their current from a public source, or go without. The magnitude of the demand in any locality, governs the question whether an electric lighting station can be carried on profitably or not. This seems a very elementary and obvious way of stating the matter; but curiously enough it is often ignored by those whose duty and interest it is to rightly understand the problem. Over and over again, we see instances of local authorities bamboozled into thinking that commercially successful central station working in their neighbourhood is a matter of water power utilization, the recovery of the waste heat of rubbish destruction, or getting hold of a job of tramway working—all sorts of considerations but the right one. Consequently, they too often plunge into a wholly unjustified venture, and discover when it is too late that the poor ratepayer has to put his hand in his pocket in order that a bank or two, a few drapers' shops, and the district council offices may enjoy the electric light at less than cost price. This is the sort of thing which it is one of the main objects of this column to prevent. Gas engineers and gas companies have no quarrel with the electric light—quite the contrary. But they have a hearty dislike for seeing communities imposed upon in this matter of central station electric lighting; and as ratepayers, their dislike becomes acute disgust. And it so happens that they are generally the only members of a community who know enough of the business side of electric lighting to expose the illusory representations of a touting electrician, who has no permanent interest in the place he selects for his operations.

We applaud the action of those gas companies whose view of the proper way of defending the communities they serve from these marauders, is that they should take away the attraction by themselves providing such small amount of electric lighting as may be legitimately needed. This can, in some instances, be done to the greatest advantage from the gas-works, whether the undertaking is owned by a company or the local authority. In the latter case, there is never any question about it; and it is impossible to argue that the ownership of the gas-works affects the executive question of competence to carry on an electricity supply branch. It is not a question here of the gas company seeking possession of a dreaded rival, or even of suppressing competition. It is merely that the company occupy a favoured and favourable position for rendering a small additional service to the community, and are willing to do it. They know there is "no money" worth speaking of in the business; but it does not necessarily follow that their action proceeds from pure philanthropy, with which, of course, they have no concern. It always pays a tradesman to keep on the best possible terms with his customers; and a shopkeeper nowadays who would not so far "oblige a customer" by procuring for him and sending home an article not ordinarily kept in stock, would soon discover his mistake. That is the long and the short of the policy inaugurated last session by two gas companies, and followed now by eight or nine more. It is a sensible policy, which deserves every encouragement. Of course, it must be carried into effect only with caution, and under strict limitations; but gas companies are not likely to fall into the extravagances and errors of inexperienced local authorities. Next week we shall endeavour to "point the moral" of these observations, by telling the tale of the Ealing installation, started three years ago to make light and profit out of dust destruction, and now costing the ratepayers about £4000 a year to keep going.

GAS AS A CAUSE OF FIRES.

The extensive fire which raged in the City on the 19th inst. has directed attention to the sources of fires in towns; and in the daily papers disparaging references to gas have been frequent. Often an overt or covert eulogium of electric lighting accompanied the reference; and the casual reader was left to infer that gas was a fruitful source of outbreaks of fire, while benign electricity never was guilty of such base behaviour. Whatever may have been the origin of the recent disastrous fire—and certainly nothing definite was known at the time the references in the Press were penned—the careful journalist would have turned to statistics for support of the charges he levelled against gas as a predominant disseminator of fires. Unfortunately, it is not the fashion with a certain section of latter-day journalists to authenticate statements which may serve to garnish topical articles or paragraphs. Electricity is still the pet of these writers, with whom it is a dictum that the "subtle fluid," to use their *argot*, can do no wrong. Moreover, established interests, as represented by the Metropolitan Gas and Water Companies, must be abused—justly if opportunity offers, but unjustly if that be, as it usually is, the easier course open to the unscrupulous contributor. Had statistics been consulted by some of the pressmen who were responsible for the comments in the daily papers on the great fire in the City, the public would have been spared many a wrong impression on the relative dangers of gas and electric lighting. As it is, it behoves us to correct the hasty statements of the lay pressmen by a reference to published and authentic particulars.

Statistical information is most complete in Germany; and we naturally turn first to German papers for a confirmation or contradiction of the view that gas is a more common source of fire than is electricity. The Germans, who individually and collectively revel in statistics, do not fail us; for, in the number of the "Journal für Gasbeleuchtung" published on the morrow of the great City fire, we find a paper by Herr A. Müller, of Charlottenburg, on "The Comparative Risk of Fire from Electrical and Gas Installations." We learn from the introductory portion of the paper that electricians in Germany, like their brethren here, loudly proclaim the security from fire enjoyed by those who use the electric light in place of gas. Herr Müller proceeds to consider if the assertions are wel grounded.

Gas lighting at the Industrial Exhibition in Berlin last year was to have been wholly avoided according to the original plans; and it was only with difficulty that the gas industry obtained the use of a special structure wherein to display lighting apparatus. Finally, in addition to this large building, the square in front of it, the road leading therefrom to the Cöpenick Highway, as well as the latter, and several restaurants in-"Old Berlin," were lighted by gas. This extensive installation was responsible for one "small" fire, caused by a gas-tap in a cellar being left open. The remaining parts of the Exhibition were lighted by electricity only, and no fewer than eleven "small" fires, one "moderate" fire, and one "large" fire occurred. The majority of these were caused either by faulty conductors or by short-circuiting.

Turning to towns, where the origin of a fire is not so easily traced, we find that the Berlin Fire Brigade reported 37 fires due to gas, and 14 due to the electric light in the year 1894-5. Taking into account the numbers of consumers of gas and electricity, these figures point to gas being by far the safer illuminant. In the same period, 92 fires were attributed to oil and candle lighting. The superiority of gas is clearly shown in these two instances; and if further proof of the mythical nature of the security from fire which electric lighting is alleged to impart were needed, it is afforded by a recent decision of the insurance offices throughout Austria and Hungary. These, on the strength of their past experiences, have refused to make the least concession in the premiums payable for the fire insurance of buildings lighted solely by electricity. Whatever security electric lighting may afford in the eyes of the electrician, it is not reflected in a diminished drain on the purse of the consumer who has been led to substitute electric light for gas on account of the alleged risk of fire with the latter.

If we look at the reports of fires elsewhere, we see the electric light continually given as the origin of the outbreak. Within two years, 2000 fires in America were traced to electrical installations; and in the course of one half hour in 1895, the Vienna Fire Brigade was called to as many as four distinct houses where electricity had caused fires to break out. Taking this year only, already notable fires in Munich, Frankfort-on-the-Main, Berlin, Hamburg, Stockholm, and Charlottenburg can be traced with certainty to electrical conductors or lamps. In Charlottenburg, indeed, electricity is little used; yet the list of fires attributed to short-circuiting is pretty extensive.

Such, briefly, are a few of the facts with regard to the relative

riskiness of gas and electric lighting. They are not put forward with the object of disparaging the latter—for electricity has a sphere of undoubted usefulness as an illuminating agent—but rather to prevent guileless consumers believing the utterances of ill-informed or interested parties, who state glibly enough that the electric light removes the danger of fire when substituted for gas lighting in a building. Reliable statistics at present distinctly point to gas as the safest of all the illuminants in general use.

THE LAW OF EMPLOYERS' LIABILITY.

THOUGH the subject has been debated at great length in and out of Parliament, probably few employers of labour in the United Kingdom would be found willing to say off-hand that they know precisely what their obligations are under the law of "Employers' Liability." For this very reason, a general welcome might be regarded as prepared beforehand for such a book as the neat little volume in which Mr. Birrell, Q.C., has republished the four lectures on the subject, forming part of a longer course delivered by him during the present year at Lincoln's Inn as Quain Professor of Law at University College.* Though the lectures were delivered before the Workmen's Compensation Bill became law, they contained references to the measure in anticipation of its passing. It will be best, however, to consider Mr. Birrell's work as presenting a synopsis and criticism of the law of employers' liability antecedent to, and outside of this particular enactment.

The first lecture deals with employers' liability at common law—that stupendous birthright of Englishmen, in obedience to which we must all do the work we have to do, from cradle to grave. This observation may strike the reader as pitched in a key somewhat differing from the low monotone in which points of law are usually recited; and it will be as well to remark at once that Mr. Birrell is anything but a "dryasdust" lecturer. There is no dull legal monotony in his utterances. Did he not, once upon a time, write a smart book entitled "Obiter Dicta"? That book fastened upon its author a reputation which he has been compelled to live up to ever since. Whether as advocate, lecturer, writer, or politician, Mr. Birrell has been expected to continue the production of "*obiter dicta*," in the fascinating style of his first popular book. It must be a little trying, sometimes; and, like all other fascinators, Mr. Birrell cannot always keep up the illusion of spontaneity. His striking antitheses smell of the lamp occasionally; and he does not always succeed in avoiding the descent into flippancy which detracts from the dignity that, when all is said, is due to be observed by those who speak in the name of Themis. Still, he is a pleasant guide to accompany through the mazes of the law, and is to be thanked for proving that the most serious of secular studies need not be carried on in the dull, heavy spirit of one who addresses himself to an essentially penible task.

"Let us have the courage to be elementary," says Mr. Birrell; and we gladly echo the cry. He accordingly begins by stating that, "in all the codes and systems of law of Western nations, we find provision made for the payment of damages in respect of injury to person or to property occasioned by negligence; nor . . . has anyone ever doubted what he meant by negligence. He means, and he has always meant, the absence of that amount of care which each man in this our social state owes his fellow." What this means in the circumstances of each particular case is another thing. As a matter of law, this liability of one man to another to make good a personal injury, sustained in consequence of an absence of a proper amount of care, is a branch of the law of negligence. It begins and ends in negligence, in a breach of the legal duty each man owes his neighbour not to hurt him. If the hurt is intentionally done, the perpetrator is not careless, but criminal. Carelessness, however—negligence—must be paid for at a reasonable rate. Here Mr. Birrell pauses for an instant to draw attention to the difference between the law of negligence and the law of insurance or warranty against accident. "The law very easily might have been that every man warranted to the full extent of his pecuniary capacity that never would he, in any circumstances, occasion hurt to his neighbour. But this is not the law, either at home or abroad." When it comes to be a question of acting by another person, or agent, matters become tremendously complicated. An enormous extension of the law of negligence has been made, covering all the cases of injuries done to the outside public by servants acting within the scope of their proper employment, though in the course of it flatly disobeying their master's orders. This is called the law of *respondeat superior*, which arises out of the necessity for finding somebody who can pay for damage done. "The common law of England, therefore, stands thus: First, a master is liable for his own negligence, both to his own workmen and to the general public, assuming, in the case of a member of the public, that he had some right to be where he was when he sustained the personal injury he complains of; and, secondly, a master is liable, according to the formula *respondeat superior*, for damage sustained by anyone by reason of the negligence of any of the master's servants acting within the scope of their proper employment." This rule works out in the well-known case of a gas company sending a fitter to cut off a consumer's meter. The man is the proper kind of workman for the job; and he has never given anybody reason to complain of his conduct as a workman. Yet on a particular occasion he fails of the full standard of carefulness required of him; and a disastrous fire results. His employers have to "pay the piper" for him.

Of course, the common law is to be interpreted with careful regard to exceptional circumstances. To revert to the last-mentioned eventuality, the question might easily arise as to how far the mischief was due to contributory negligence on the part of the plaintiff. Mr. Birrell cites an observation of Lord Bowen's defining contributory negligence as meaning "that the plaintiff has himself contributed to the accident in such a sense as to render the defendant's breach of duty no longer its proximate cause." As, for example, in the illustration, the consumer may have done something to prevent the fitter from doing his work properly—as by hurrying him, and so forth. This leads to very nice inquiries.

Again, Mr. Birrell observes that the law might very well have been otherwise. "The judges might have said in early cases to a defendant in an action for damages for negligence, 'as soon as it is established that but for your negligence—that is, breach of duty—the accident could not have happened, we will inquire no further. You are admittedly at fault—you have done what you ought not, or you have left undone what you ought, and you shall not be heard to say that he who suffers in consequence of your act or omission might have escaped unhurt if he had taken greater precautions than he did.' Had the makers of our common law chosen to say this, who could or would have said them nay? But they did not. They laid emphasis on the words *in consequence of*, and took the distinction between proximate and remote causes, with the result that our law reports and newspapers record thousands of cases raising this vexed and vexatious question of contributory negligence." This is very clever of Mr. Birrell; but it is difficult to avoid the conclusion that the admission of the doctrine of contributory negligence is essential to the course of justice. To confine ourselves to subjects of special interest to our readers, a gas company lay open in a thoroughfare a trench into which a blind man falls and hurts himself. Are the conditions of safety quite equal for a blind man and a seeing person?

This consideration at once brings up Mr. Birrell's "remaining question," which, as he says, the common law asks in such circumstances. It is: "Had the injured man such a knowledge of the danger or dangers that actually caused the disaster as to create the necessary inference that he voluntarily encountered them?" If so, he has no remedy. "A grown man who voluntarily incurs a known risk must not grumble if he not only runs but realizes it. This seems sound sense." Again, however, the difficulty comes when the principle is applied to the facts of modern life. What constitutes knowledge of a risk, and what proves willingness to run it? A workman knows, or thinks he knows, that a certain working rule is hazardous. If he complains of it to his superior, and his superior rejects the warning, what is he to do? Does he sacrifice his right to recover damages for injury, under the common law, by remaining in his employment? If not, what becomes of the maxim? Next comes the famous case which led to the establishment of the rule of "common employment." This was the case of *Priestly v. Fowler;* and the dictum of Sir William Erle in regard to it was that "a servant, when he engages to serve a master, undertakes, as between himself and his master, to run all the ordinary risks of the service, including the risk of negligence upon the part of a fellow-servant when he is acting in the discharge of his duty as servant of him who is the common master of both." Of course, Mr. Birrell, with his up-to-date notions, makes fun of this "beautiful language of a great Judge;" but we suspect that he would have felt differently in 1837, when this judgment was pronounced. He is forced to admit the "remarkable fact" that prior to 1836 our law reports do not show a single case of an action brought by a servant against his master for damages for injuries occasioned by the negligence of a fellow-servant. This fact, at any rate, may be allowed to weigh for what it is worth as evidence that, in practice, servants did immemorially accept the risk first defined in set terms by Sir William Erle.

The risk of practical injustice arises when the "servant" of an older order is supplanted by the "workman" of an industrial era. A rule of law and life that did very well as among grooms and housemaids is not necessarily sufficient for the circumstances of those who are only "servants" in a modified sense. This view of the matter does not escape Mr. Birrell, who admits that the risks of domestic service need not occupy the attention of the Courts. It was not until 1850 that, in the case of *Hutchinson v. The York, Newcastle, and Berwick Railway Company*, the new doctrine of common employment attained its majority. Since then it has been decided that "a labourer is a fellow-servant with an engine-driver and with an inspector, a scaffolder with a builder's manager, a miner with an underlooker, the manager of a lucifer-match manufactory with a boy at 5s. a week, a carpenter on the roof of a station with the men shifting a locomotive engine below." Lastly, in 1865 it was held "that a miner was a fellow-servant with the certificated manager of a colliery appointed pursuant to a statutory obligation; and therefore, though the miner

* "Four Lectures on the Law of Employers' Liability at Home and Abroad." By Augustine Birrell, M.P. London: Macmillan and Co.; 1897.

was killed by the negligence of the manager, the widow could recover nothing from the colliery proprietors." This seems a carrying of the force of logic to the extreme; but it is hard to say where else the line is to be drawn. Mr. Birrell does not venture to characterize the doctrine as a ridiculous one; but he hints that it all started from an invention of the judges. "When you once begin inventing terms for other people's contracts, there is usually a good deal to be said in favour of your fancy. Supposing our judges had decided, as they have in France, that it is an implied term of every contract of service that the master shall insure his servant against all accidents in the course of the employment which are not solely attributable to the servant's own negligence or to unforeseen and most unlikely occurrences, who would have found fault with this fiction?" Just so. This is one of those things that are ordered differently in different places; and who shall say which is absolutely the best way?

We must leave the rest of our notice of Mr. Birrell's work for another article. The book is small; but it is not to be lightly dismissed after one glance at its contents.

PERSONAL.

At a meeting of the General Committee of the British Association recently held, Sir W. CROOKES, F.R.S., was elected President for next year; and it was decided that the meeting in Bristol should open on Sept. 7, 1898.

Mr. R. MERRELL, the Manager of the Mossley Corporation Gas-Works, has resigned his appointment, which he has held for about twenty years. Mr. Merrell was originally with the Gas Company; and on the transfer of the undertaking to the Corporation, he entered their service.

At the Town Hall, East Cowes, on the 20th inst., Mr. R. FISH, the lessee of the East Cowes Gas-Works, was presented with a Gold Jubilee Medal, as a small acknowledgment of the services he rendered as Treasurer of the Jubilee Celebration Committee. The presentation was made by Mr. G. Groves, the Chairman of the District Council.

Mr. H. PERCY BOULNOIS, whose resignation of the City Engineership of Liverpool was recently noticed in the "JOURNAL," has been offered, and has accepted, an appointment under the Local Government Board; and he will commence his duties on the 1st prox. The members of the Liverpool Engineering Society have presented Mr. Boulnois with an illuminated address, the staff of the City Engineer's Department have given him a silver inkstand, ivory paper-knife, and accessories, and a deputation from the crews of two steam-hopper barges have asked him to accept a stationery cabinet, as mementoes of their friendly relationship with him during his residence in Liverpool.

In the "JOURNAL" last week, we briefly recorded the presentation of a testimonial to Mr. W. J. DIBDIN, F.I.C., F.C.S., the late Chemist and Superintending Gas Examiner to the London County Council. The ceremony took place at a complimentary dinner given to him by the staff of the department of which he was till recently the head, at the Holborn Restaurant, on the 20th inst.; the new Chief, Dr. Frank Clowes, presiding. The presentation consisted of an illuminated address subscribed to by 85 members of the Chemical and Gas Department. It was read by the senior officer (Mr. Livingston), and testified to the appreciation of the subscribers of the uniform kindness and impartiality shown towards them during the fifteen years Mr. Dibdin had held his appointment. They expressed the hope that in his new sphere his efforts might meet with the unqualified success which had attended them in the position he was relinquishing.

It may be remembered that Mr. T. B. WALKER, son of the Manager of the Wrexham Gas-Works, was a few weeks ago presented with a gold watch by the Mayor of the borough, for his gallant attempt to rescue Mr. Hesketh, Assistant-Manager, from suffocation on the 24th ult. The heroic conduct of this young man, who is only nineteen, has been recognized by the Royal Humane Society, who have awarded a silver medal to him, and a bronze medal to HENRY PERRIN, the stoker who so bravely assisted in the rescue. Dr. H. V. Palin, who was summoned to the scene of the accident, is the instructor of the Ambulance Society lately formed by the Wrexham Exchange Club; and he was accompanied by one of the certificated members, Mr. J. E. JONES, of the North and South Wales Bank. Under Dr. Palin's directions, Mr. Jones rendered practical assistance; devoting his efforts for more than an hour to producing artificial respiration. Mr. Hesketh was, unfortunately, beyond recovery; but, by persistently following the prescribed method, Mr. Jones happily succeeded in restoring another of the sufferers who seemed to be beyond hope. His services have been acknowledged by the presentation to him by Dr. Palin, in the presence of a few friends, of a silver-mounted walking-stick. The great value of training in ambulance work is again exemplified by the lamentable occurrence above alluded to.

Rawson's Incandescent Gas-Light Patent.—Application is to be made to Parliament next session to reinstate, continue, and confirm the patent No. 11,161 (Sept. 1, 1886), granted to Frederick Lawrence Rawson and William Stepney Rawson, for the term of fourteen years, for improvements relating to the production of light by the incandescence of refractory materials.

NOTES.

A Suggestion for Interior Lighting.

Yet another experiment in the direction of adapting electric arc lamps to interior lighting is reported from the Columbia University. It is stated that the new library of this building is to be lighted on a "novel" system, which has been specially devised by Professor Hallock, in order to gain the advantage of diffusion from a large central surface, and at the same time to be "realistic"—whatever the last term may be intended to signify. The method of lighting is described in "Industries and Iron" as follows: "In the centre of the hall is suspended a hollow globe 7 feet in diameter and painted a dull white, which is to diffuse rays by reflection. Located at intervals around the gallery, but out of sight, are eight arc lamps, the beams from which are directed upon the sphere. A background of blue is afforded by the ceiling, so that a moonlight effect is produced; the result being described as extremely fine." It must strike the ordinary practitioner in interior lighting that this is a style of treatment more suitable to the pantomime stage than to a reading-room; and the fact of eight arc lamps being required to produce the effect, whatever it is, puts Professor Hallock's design outside the region of economical lighting practice. It might be suggested that the term "roc's-egg system" would be a not unfitting designation for this method of lighting an interior.

Increasing the Strength of Castings.

Writing in the "Engineering Magazine," Mr. W. Worby Beaumont commends a simple and inexpensive process for increasing the strength of iron castings made in the ordinary way. It is called the Doherty iron castings process, and consists essentially of the addition of a small quantity of dry steam to the ordinary cupola blast. This appears a small thing; but as a result it is claimed that the castings are increased in strength by at least 25 per cent., the castings are themselves cleaner, their surface is softer and much more easily machined, and the finished surface is improved and easily takes a high polish. The advantages to the mechanical engineer recited by the author are that the castings may be of less weight or of greater strength, and many things not now sufficiently strong when made of cast iron can be made so by the new method. Breakages will be less frequent, and the toughness of the iron affords many workshop advantages. Their plate castings, it is mentioned as proving this toughness, may be punched with an ordinary punching machine, with holes from $\frac{3}{8}$ to $\frac{3}{4}$ inch in diameter or more, and within $\frac{1}{4}$ inch of each other. The advantages to the founder are improved castings from ordinary pig and scrap, the possibility of using coke that is not of the best foundry class, and fewer breakages. It would appear that such tough cast iron should be useful for gas-stove castings.

Electricity and Railway Locomotion.

In his address as President of the Institution of Junior Engineers, Mr. Aspinall, the Chief Mechanical Engineer to the Lancashire and Yorkshire Railway, discoursed luminously on various points of modern railway engineering. Among other topics, he dealt with the question of the applicability of electricity to the working of railways. In opposition to certain recent statements of Professor Forbes, to the effect that there is nothing to prevent the immediate application of electricity to the working of the Metropolitan Railway, Mr. Aspinall thinks the problem of moving heavy loads at high speed by means of electricity has not yet been so solved as to warrant the immediate replacement of steam locomotives by electric plant. Mr. Aspinall answered one of the questions asked in one of the recent "Electric Lighting Memoranda" of the "JOURNAL" by stating that "it did not appear that if motors were attached to the axles of each vehicle in a train the aggregate weight of the motors on an ordinary main-line train of ten or twelve carriages was likely to be less than the weight of the present steam locomotives. No saving could therefore be looked for in this direction in the present state of knowledge." On the other hand, if such a method of traction came into use upon a new railway of which the bridges had yet to be constructed, an obvious saving in the original outlay could be obtained, since the bridges would not have to be constructed to carry heavy locomotives. This pronouncement, however, leaves the main question very much where it was, subject to the comment that one of the highest authorities on mechanical engineering as applied to railway working does not agree with the proposition that the time is ripe for the suggested experiment.

The Divining-Rod.

There has been of late a revival of interest in the "divining rod" in regard to its limited use as a supposed means of indicating the locality of underground springs and watercourses. It is, or should be, well known that in times past the divining-rod was commonly employed with the object of discovering hidden mineral deposits and many other things; but whenever it is spoken of nowadays it is always as a means of locating underground waters. The columns of the "JOURNAL" for some years past have been studded with references to the work of the "dowser," which is the popular name given to the person who is supposed to possess the peculiar faculty, not common to mankind in general, of physical sensitiveness to the proximity

of water underneath the surface of the ground. Professor W. F. Barrett has lately contributed to the "Proceedings" of the Society of Physical Research a long paper purporting to be a scientific inquiry into the subject. Due mention is made of the case of the adits at the disappointing well at the water-works of the Richmond (Surrey) Corporation. Failure to strike water there led to the employment as a forlorn hope of two independent dowsers. Their indications did not agree, and when borings were made at the spots indicated little or no success was met with. In another case, Professor Barrett himself tested the powers of a diviner, in the presence of persons having a complete knowledge of the existence in the locality of springs, wells, and pipes, which the diviner failed to find. Criticizing the subject-matter of Professor Barrett's paper, "Nature" remarks that the question is left in the same state as before. The Richmond inquiry was good; but the failure is explained away by the assertion that the dowsers employed were not in the first rank, and were young and inexperienced.

New Building Materials.

Mr. H. D. Searles-Wood recently read a paper before the Architectural Association descriptive of the new building materials "asbestic" and "petrifite." The former is a name given to a bye-product of the manufacture of asbestos from the serpentine in which it is found. After the fine white fibrous asbestos has been extracted by machinery, the so-called "asbestic" remains in the form of a sand useful for making a fireproof, sound proof, and exceedingly tenacious plaster with common lime. The asbestic is now being made up in slabs about ¾ inch thick. These can be worked as easily as wood, and are weather-resisting and uninflammable. The material is recommended for roofing factories where hot air within would be detrimental to slates and opaque glass. It ought to answer well for retort-house roofs. The other new material is a white cement which appears to have the power of binding together any imaginable powdery or loose substances. The principle of the invention was discussed in 1891; but it was not for some years afterwards that a cheap and practical method of making the petrifite was worked out. Even now the material is barely in the market. Some tests of it made by Messrs. Kirkcaldy show that petrifite used with sand or other substance in the same way as portland cement, is far superior to the latter in every respect. As regards hardness of surface and internal hardness, there is no appreciable difference betwen 2 to 1 portland and 6 to 1 or 9 to 1 petrifite. The tests made to ascertain the relative adherence of petrifite to mortar show that 6 of sand to 1 of petrifite adheres as well to the surface of rough bricks as good portland cement mortar mixed 3 to 1. In the case of bricks with rather smooth surfaces, petrifite mortar gave nearly four times the adhesive strength. Petrifite mortar mixed 3 to 1 with smooth bricks had ten times the adhesive strength of the same proportion of portland cement mortar. Another feature of petrifite is that it adheres to wood. It is also good for binding dirty, or unwashed materials, which would be fatal to portland cement; and it keeps well. Petrifite can, moreover, be used with sea sand, as its compounds do not effloresce. Gauged with sawdust, petrifite makes an uninflammable artificial wood. Coke or coal dust and 3 per cent. of petrifite can be moulded into briquettes which will only absorb 6 per cent. of water.

The Amalgamation of Incandescent Gas-Light Companies.—A great deal of interest is being evinced on all hands in the amalgamation of the Incandescent Gas-Light Companies working under the Welsbach patents; and, as may well be imagined, it has thrown a considerable amount of work on the shoulders of the Secretary (Mr. L. de Fonblanque) and the other officials at the head offices. One point which does not seem to have been generally recognized is that the Incandescent Gas-Light Companies as at present existing merely stand in the position of vendors to the Promoting Company, although this was made perfectly clear by Major-General Beresford at the meetings of the Companies on the 19th inst., as reported in last week's issue. Then in connection with the issue of the capital of the new Company, many of the district agents and traders under agreement with the Incandescent Gas-Light Company, as well as customers of the former, have expressed a desire to become shareholders; and we are able to say that in this respect the Directors and management have not been unmindful of those who have assisted in building up the present colossal business. They have made an arrangement with the Promoting Company whereby the agents and traders are to have special facilities for acquiring shares. Each agent will receive a certain number of application forms; and these he will be asked to introduce to the notice of his customers who use the incandescent gas-light. Upon the forms he issues, the agent will be required to stamp his name, as he is to be allowed by the promoters a commission on the allotments made to his customers. Thus the agent has a double interest in the matter—he may secure shares for himself, and a commission upon shares procured by his customers through his instrumentality. The wisdom of this course is apparent; for it is certain that nothing can be more conducive to increased and lasting prosperity than gaining the interest of agents and customers in the welfare of the Company.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Bradford.

Last Saturday, the 112th Quarterly Meeting of the Manchester District Institution of Gas Engineers was held at Bradford, under the presidency of Mr. ROBERT PORTER, of Elland. The Yorkshire members had already assembled in large numbers when the Manchester contingent arrived at Exchange Station shortly before midday; and the conveyances in waiting were rapidly filled, and a start made for the Bradford Corporation new electricity works in Valley Road. Here an hour was spent in a most interesting inspection of these modern works, full particulars as to the arrangement of which were courteously supplied by Mr. A. H. Gibbings, the Electrical Engineer to the Corporation, who attended to conduct the party round the establishment of which he is justly so proud. No details need be given here as to the plant and its uses, as an item of business at the afternoon meeting was the consideration of a paper descriptive of the works, which had been prepared by Mr. Charles Wood, the Gas Engineer, from notes supplied by Mr. Gibbings. At the close of the inspection, the party drove to the Midland Hotel, where lunch was served; and thereafter the business meeting was held in the reading-room of the hotel.

On Mr. PORTER taking the chair,

The minutes of the previous meeting were submitted and adopted.

The HON. SECRETARY (Mr. S. S. Mellor) read the following list of members proposed for election:—

Mr. Stephen Halstead	Bolsover.
Mr. Harry Kendrick	Stretford.
Mr. W. L. Sutcliffe	Brighouse.
Mr. Edward Williams	Conway.

Mr. W. W. HUTCHINSON (Barnsley), in moving the election of these gentlemen, referred to the increase which had taken place in the number of members recently; there now being some 130, whereas not long ago under 100 was considered a very good total. Not only had the Institution a strong body of members, but they had all grades among them, and were well qualified to give a good account of gas affairs generally.

Mr. S. MEUNIER (Stockport) seconded the resolution.

The PRESIDENT said he trusted the addition now made to the roll would be alike beneficial to the Institution and to those elected.

The resolution was passed unanimously.

ELECTION OF PRESIDENT.

Mr. ISAAC CARR proposed the election of Mr. W. S. Haddock, of Warrington, as President for the ensuing year. The appointment of a gentleman to preside over them from year to year, he said, became of increasing importance as each succeeding year saw the Institution grow in numbers and in influence. Mr. Hutchinson had said he could remember the time when they thought 100 members was a good number; but if that gentleman would tax his memory, he would call to mind the time when they thought 20 or 30 was a good average meeting. Any gentleman who allowed himself to be put forward for the office of President, must be prepared to sacrifice himself for the welfare of the Institution, because the work attaching to the office could not be carried out without a good deal of steady application. Very great pressure had been brought to bear on Mr. Haddock to allow himself to be nominated for office; and probably had he consulted his own wishes, he would have withdrawn his name. He was in every way capable of doing the work required of him; and he (Mr. Carr) thought at the termination of his year, it would be found that Mr. Haddock had not only left the Institution better than he had found it, but had done himself a great deal of good. In conversation with a member that day—speaking of his own experience—he (Mr. Carr) said that he felt great reluctance in taking the office, but felt greater reluctance in giving it up. It was one of the greatest pleasures of his life to look back to the year when he presided over the Institution; and he felt that personally it had done him a great deal of good, for anybody who took the office and did his duty to the Institution could not do so without himself deriving benefit.

Mr. G. E. STEVENSON (Manchester) had great pleasure in seconding the resolution. He had not had the advantage of so long an acquaintance with the proposed President as many of his colleagues; but he felt perfectly certain that none of them would be disappointed in Mr. Haddock as their President. As to the personal benefit derived by any gentleman filling the office, he had no doubt that must be the case with anyone who

carried out his duties with satisfaction to himself and his colleagues. A very happy selection had been made in the nomination of Mr. Haddock.

Mr. MEUNIER had great pleasure in supporting the resolution, because he thought Mr. Haddock was the right man in the right place. To see Mr. Haddock's genial face at the head of affairs during the forthcoming year, would of itself be a very pleasant feature at their meetings.

The resolution was unanimously passed.

Mr. HADDOCK, in returning thanks for his election, said he felt diffident in accepting the position to which he had been appointed; but he would do his utmost to carry the work through in a proper manner. He hoped the forecast that had been made that day would be found to be justified when his term of office was over.

The PRESIDENT then submitted the following paper descriptive of the Bradford electricity works, a print of which had been distributed among the members:—

BRADFORD CORPORATION ELECTRICITY SUPPLY.

The Bradford Corporation were the first public body in the kingdom to adopt electricity as an illuminant. The old works, situated in Bolton Road, were completed, and commenced to supply the public in September, 1889. The first cost of the buildings and plant amounted to £20,000; the system adopted being the two-wire continuous current.

The generating plant consisted of three Lancashire boilers, each of 180 indicated horse power; and three steam-engines of the inverted vertical type, each of 150 indicated horse power, and working at 120 lbs. steam pressure—two being supplied by Messrs. Willans and Robinson, now of Rugby, and one by Messrs. Marshall, Sons, and Co., of Gainsborough. These engines were direct-coupled to Messrs. Siemens Bros. and Co's. dynamos, developing 120 electrical horse power (90 kilowatts) each. About 10 miles of cable were put down, including four feeders; and this work was entrusted to Messrs. Siemens Bros. and Co., who were also the manufacturers. The firm also furnished the necessary electrical instruments and apparatus for controlling and regulating the supply.

At this time the demand for current only necessitated the plant being run for a few hours before midnight, as it was confined to large shops and business houses at this early period of its history. In less than one year, the applications were so numerous that the plant had to be extended at an extra cost of £30,000. A portion of the additions consisted of a secondary battery of 70 cells, each of 1000 ampère hours' capacity. This served to improve the steadiness of the supply, besides proving a source of great economy in the working of the station.

By the end of the year 1891, an additional 10 miles of mains had been laid, owing to the unexpected increase in the number of applicants for supply. A few electric motors for working hoists and cranes were now connected to the supply; and the plant had to be kept running throughout the 24 hours. In 1892, further additions to the plant became necessary; and this year's working realized the handsome profit of £1385.

In the year 1893, Dr. Hopkinson's three-wire system of distribution was resolved upon. Though it was not found expedient to change over the whole supply immediately, in all subsequent extensions of mains a third wire was laid. A further sum of £30,000 was required for the extensions, thus bringing the total capital of the undertaking to £80,000. A substantial increase in the net profits was the result of the working in 1893; the sum of £1805 being set aside. In 1894, still further extension to the plant became necessary, and the marine type of boiler was adopted; its quick steam-raising qualities being considered of very material advantage in the case of a sudden call upon the station through dull or foggy weather intervening. Orders were placed for two boilers fitted with Ellis and Eaves' system of induced draught, and two Willans-Siemens sets of 300 indicated horse power each. These sets had been so successful that it was deemed advisable to adhere to the type throughout.

The demand had grown so rapidly that the Electricity Committee had experienced difficulty in keeping pace with it; the full capacity of the plant in 1895 being 18 per cent. below the maximum possible demand. There was no "stand-by" plant to rely upon in the case of emergency. On the advice of the Engineer (Mr. A. H. Gibbings), it was decided to build a new station, on a site more favourable for extension than that of the old station; and an additional £40,000 was expended. In 1896, all the consumers who were being supplied at a pressure of 115 volts were changed over to the double pressure of 230 volts; and the three-wire system of distribution was adopted throughout.

In 1897, the price for motive power was reduced to half that for lighting—namely, 2½d. per unit—and Mr. Gibbings's scheme of hiring out motors and arc lamps, as well as the free supply of lamps to consumers, was adopted. Up to this time no other undertaking in the kingdom has granted these concessions to their consumers, though world-wide interest has been displayed in the schemes, which have proved perfectly successful, as may be gathered from the fact that in less than six months over forty additional motors have been connected to the supply—bringing up the demand for motive power during the daytime to an equivalent of about 300-horse power. The combined horse power of all the motors connected to the supply now reaches a total of 642. Over 200 arc lamps have been connected on the hire system.

There are now about 40 miles of distributing mains already laid within the area of supply of 9 square miles; the number of consumers having increased to 600, and the total horse power to 3600. This plant is calculated to supply continuously some 60,000 8-candle power lamps.

The following figures show the financial results for the year ended in 1896:—

Total capital expended	£105,275
Total revenue	16,195
Percentage of gross profit to capital	11·39

The total revenue was allocated as follows:—

Total revenue		£16,195
Interest	£2301	
Depreciation	3000	
Sinking fund	2803	
Working costs	6143	
		14,247
Net profit		£1,948

Costs per Unit.

Working costs	1·03d.
Management expenses, including rent, rates, and taxes	0·78
Interest, depreciation, and sinking fund	2·39
Total costs	4·20
Average price obtained per unit	4·66

The amount set aside for depreciation and redemption of capital—viz., £8104—was 7·69 per cent. on the total outlay.

The new electricity works are situated at the corner of Valley Road and Lionel Street. The building is plainly but substantially built of local stone, in the Renaissance style, and is adapted to the purpose for which it is required. The works are in one block. They may be divided into office buildings, fronting Valley Road; engine and dynamo room, behind offices; and boiler-house, running parallel with Lionel Street.

The engines are by Messrs. Willans and Robinson, of Rugby. They consist of two Willans's patent central valve engines, triple expansion type, having three cranks at 120° apart. They are each of 600 indicated horse power when running at 300 revolutions per minute, with a steam pressure of 180 lbs. per square inch at the stop-valve; the cranks running in a bath of oil, lubricating all the working parts by splash. The range of speed capable of being regulated by hand is from 270 to 300 revolutions per minute. The six-pole dynamos are by Messrs. Siemens Bros. and Co., of Woolwich, and are direct-coupled to the engines, each developing 500 electrical horse power at 300 revolutions per minute, and having an output of 750 ampères at 500 volts, when running at full speed.

The boilers, which are of the marine type, are by Messrs. John Brown and Co., of Sheffield, and are fitted with Ellis and Eaves' induced-draught system, each providing steam for 600 indicated horse power when working on a consumption of 20 lbs. of water per indicated horse power, and capable of providing 800 indicated horse power when forced, and at a higher consumption of fuel. They are made in accordance with Lloyd's rules and regulations, for a working pressure of 200 lbs. per square inch. The motive power for working the induced-draught apparatus is provided by two electric motors. These develop 21 brake horse power each; and they were made by Messrs. Ernest Scott and Mountain, of Newcastle-on-Tyne. The electric boiler-feed pump is also by the same firm. The condensing plant includes air-pumps and circulating pumps, driven by electric motors, and is capable of condensing 30,000 lbs. of steam per hour at 200° Fahr. It is by Messrs. Cole, Marchent, and Morley, of Bradford; and the electric motors are by Messrs. Rosling and Appleby, of Bradford.

The steam-pipes, by Mr. John Spencer, of Wednesbury, consist of one horizontal main steam-ring of 10-inch bore lap-welded steel tubes, having cast-iron tee-pieces for derivation of boiler and engine branch-pipes. The branch-pipes are of solid drawn copper. The main exhaust-pipes consist of 20-inch bore cast-iron pipes, made in sections, with inlets formed for connecting the respective branch-pipes. The branch-pipes are from 14 inch to 18 inch bore.

The switchboard, by Mr. G. A. Steinthal, of Bradford, consists, above the platform floor, of ten slate panels. The board below the platform floor also consists of ten slate panels. The ampère gauges and electrostatic voltmeters on the panels above the platform are Lord Kelvin's instruments. Thomson-Houston recording watt meters are fixed on the panels below the platform floor, and are used to register the output of power direct from the station. The travelling crane, by Messrs. Joseph Booth and Bros., of Rodley, is constructed to lift 12 tons.

The cables connecting the old and the new works, consist of five lines, each 1030 yards in length, of 1½ square inches sectional area high conductivity copper. The insulation material used is the firm's patent, and consists of high-class hemp paper, specially manufactured, and impregnated with resin oil. The insulation is protected with a solid lead tube of a radial thickness of ⅛ inch. A further protection consists of two ribbons of mild sheet-steel, wound one over the other, so that the convolutions of the upper layer overlap the portions of the cable left unprotected by the lower layer. About 1050 yards of three-core

pilot wire is also laid with the above-named cable, to which the registering instruments on the switchboard are connected.

The estimated cost of the new works is as follows:—

Buildings	£11,500
Condensing reservoir	220
Machinery, including—	
Engines (two 600 indicated horse power)	4,400
Dynamos (two 500 electrical horse power)	2,650
Feed-pump	175
Boilers (two)	3,000
Weighing machine	100
Steam-pipes, valves, &c.	1,135
Condensing plant	1,500
Electric-lighting of building	50
Batteries	750
New switchboard	500
Cable (for extension)	4,000
Travelling crane	320
Cables (for change to three-wire system)	9,700
	£40,000

In response to an invitation by the President,

Mr. A. H. Gibbings supplemented the above description. He said he did not know that there was much to add to what the members had themselves seen that day at the works, and to what would be found in the printed description. He thought perhaps a few words—first with regard to the plant and the design of the station, and, secondly, on the system which had been adopted at the works—might be of interest to some of the members who were almost as equally concerned in electric lighting as they were in the supply of gas, and which he was pleased to see becoming more united than they had hitherto been. The plant which they had seen that day was the combined plant of Messrs. Willans and Robinson's engines and continuous-current dynamos. The aim of the designers of their works had been to reduce it to the utmost simplicity possible. As the most valuable patents were those of the most simple construction and design, so he thought the most satisfactory work of an electric lighting, or he supposed of any other installation, was that it could be reduced to the most simple form. If there was anything at all complicated about the machinery, it might be found in the new type of boilers which had been adopted. These boilers were already beginning to be taken up very largely throughout the country. They were made by Messrs. John Brown and Co., Limited, and combined the system of Ellis and Eaves' induced draught, which was obtained by means of a fan driven by a motor at the back of the boilers. With this forced draught, it was found that with a little chimney they could get as good results as could be obtained with the best water-tube boiler on the market. The members had also seen the arrangement that had been made for tipping coal in front of the boilers. With regard to the engine-room, they had endeavoured to be equally simple in its construction. Since the members were there last year, a very great change had been effected in the system of supply. The pressure had been doubled on the three-wire system, from 115 to 230 volts. Consequently the total pressure was 460 volts, instead of 230. The area of supply increased with the increase of pressure; so that, whereas last year they could only supply an area of about 1 square mile—that was to say, a feeding-point of five-eighths of a mile from the central station—they could now supply 1½ miles from the feeding-station, giving an area of 9 square miles. This, he thought, would be found to be very largely the solution of the battle of the systems—the system of the high-tension alternating and the low-tension continuous. There had been more animosity between the various exponents of these two systems than there had ever been between electrical engineers and the engineers of gas undertakings. He thought this controversy was now likely to be settled; and this fact might be of great interest to those towns where they were coupling the two supplies. This high-pressure would certainly enable a very large number of the smaller towns in the United Kingdom to be directly supplied with electricity without the complicated means of transforming devices. In conclusion, he expressed the hope that those who had visited the works had obtained all the information they desired.

The President said they had listened with very great interest to Mr. Gibbings's instructive remarks. Perhaps this question could not be technically discussed by the members, as they had not very much experience on the subject; but there was one lesson that might be drawn from what they had seen and heard; and that was that they had a very formidable competitor in the field. They had seen, and he thought Mr. Gibbings had referred to it in his paper, the advance that was being made in lighting by electricity in Bradford. Not only was it being largely used for lighting, but it was also used for motive power; and he believed during the last twelve months the application of electricity for motive power had increased something like 400 per cent. If there were any members present who were in the habit of shutting themselves up in the four corners of their works, and resting satisfied with all that came to them, and not looking after that which did not come, they ought to take warning from what they had seen that day, and stir themselves to do their utmost to extend gas lighting.

Mr. E. A. Harman (Huddersfield) said they had all been delighted with what they had seen that day at the works. One thing that struck him particularly was the simplicity of the plant; and a comparison of the small area occupied by it with the immense amount of work produced, was very striking. He next referred to the extreme cleanliness of the works, which could not have done other than remind them of the state of things existing in their own retort-houses—especially where inclined retorts were used. In connection with the boilers also, the system adopted seemed to be delightfully simple. Electric motors were being used at the works for every kind of movement. There was an electric crane, an electric fan, and so on; and he thought it was high time they employed some of this clean machinery in their retort-houses. As to the competition which had been referred to by the President, they would all agree that that was a very healthy thing. It brought out one's best faculties. They were not afraid of it if it were only conducted legitimately; and he believed the competition they had so far had with electricity had been so carried on. When they came to deal with actual figures, cost for cost, gas was not afraid of the result. He was sure he would express the views of all if he conveyed his thanks to Mr. Gibbings and the Bradford Corporation for the courtesy they had extended to them.

Mr. G. E. Stevenson (Manchester) was sorry he was not competent to say anything much about the Bradford electric-light plant; but he had been charmed with the cleanliness of the place. The building he thought was a most suitable one for the purpose; and he only wished they could persuade gas committees to have the buildings on gas-works a little brighter and more ornamental, instead of the bare walls they were accustomed to. He would not attempt to make any comparisons between electric plant and gas plant. The statement that Mr. Gibbings had prepared was full of information; and he felt that they could not criticize it there to any great extent, or refer to it further than to note one or two salient points. One of these rather frightened him; and that was the great reduction that appeared to be taking place in the working expenses for the production of the electric current. Mr. Gibbings had put the working cost at a little over 1d. per unit; and if they reckoned 10 or 15 units as equal to 1000 cubic feet of gas, it would be found that the working expenses were not much in excess of the cost of gas. Fortunately, there was a saving clause; and that was in the interest depreciation and sinking fund. But he was afraid they could not expect this saving clause to remain as it was very long; so that he felt it was an item of serious import for them. He did not see why they should be afraid of electricity not costing more than gas, nor of its combination in union with gas. He knew of gas engineers who had introduced electricity freely into gas-works for purposes for which it was convenient; and should be pleased to do so himself if occasion offered. At the same time, no doubt to a certain extent it was very true that electricity was gradually taking the place of gas in a vast number of positions for lighting purposes. It might also take the place of gas for motive power; though he thought it was more likely to encourage and increase it than otherwise. With regard to the remark that had been made, that they might have electric motors in gas-works to assist them in their work, he thought they were not without the means of producing motive power by gas; and if they were to try to encourage the use of their own motive power—for charity began at home—then it would be time to think of having electric motors later.

Mr. T. B. Ball (Rochdale) was sure they would have no hesitation in passing a vote of thanks to the Bradford Corporation for the privilege of inspecting their newest electric generating station, and to Mr. Gibbings, their Electrical Engineer, for his courtesy and attention that day. It was perhaps encroaching to some extent on the good nature of Mr. Gibbings that they should have two visits to his works in the course of little more than a year; but he thought the Mayor of Bradford was to some extent responsible for this, by expressing the hope that they would come and see the new station when it was opened, and thus have a better opportunity of forming a judgment as to the methods adopted by the Corporation of Bradford in carrying on the Municipal enterprise. From what the members had seen that morning of the electric lighting plant, so far as they could judge of it, it left nothing to be desired. While the expenditure did not appear to have been lavish in any direction, there did not seem to be anything omitted which could add to the economical working of the concern. It did appear at first sight that an expenditure of some £3000 on two boilers was rather extravagant; but, of course, it was one of those outlays that had to be justified by the results, and Mr. Gibbings told them that the results did justify the expenditure. In manufacturing towns, one at times heard of smoke nuisance; and he wondered what would be the effect on these two boilers if something happened to the fans. But he supposed nothing ever did happen to an electric fan. He thought it would be safer to have the chimney built a little higher. As Mr. Harman had said, one could not help a feeling of envy, on walking through these works, at the unspotted appearance of everything. They could not hope to invite a company of electric engineers to visit a gas-works and come away with less of the works about their person than they had come away from the electric works with that morning.

Mr. John Marsland (Sowerby Bridge) seconded the motion.

The resolution having passed unanimously,

Mr. Gibbings thanked the meeting for the very hearty way in which the vote of thanks had been received, and promised that he would convey the same to the Chairman of his Committee.

Personally, he felt very highly honoured indeed that the members had visited their works, and had allowed him to give a description of them. His entire wish had been that those of the members of the Institution who were interested in electricity should have the benefit of whatever information he could possibly give them relating to their new works. They had not only endeavoured to keep up with the times, but had gone in for increasing the area of supply, and one or two other little matters. Bradford was the first Corporation to change over to the higher-pressure supply, which he thought was going to make electricity so very much more successful than in the past. With regard to the working cost, as mentioned by Mr. Stevenson, he supposed that would differ very slightly from the working cost of a gas-works; but they had no storage, and the reason why they had to provide such heavy capital outlay was that they were absolutely obliged to keep up their price per unit until some scheme was brought forward for storing electricity. His own opinion was that these things did not come in a revolutionizing manner—it was always a gradual movement; and no one really suffered in the long run. They had seen this in the development of electric lighting during the last ten years; and they had seen it to a much greater extent in the development of gas lighting. His own opinion was that some day they would get electric storage; and he hoped it might come in a form that it would be a question of thermal storage of electricity.

Mr. E. A. HARMAN (Huddersfield) read the following paper on

SULPHATE OF AMMONIA.

Sulphate of ammonia is a subject which is at the present moment rightly occupying a considerable amount of prominence among us; and in view of the recent steps taken by the formation of the Sulphate of Ammonia Committee in London (of which I have the honour to be a member), I considered that a few passing remarks upon it might be of general interest, not so much in conveying anything either novel or new, as more especially to keep the object we all naturally desire so much—namely, an improved market—before us. I shall also hope to elicit from the more experienced members their views, and information as to the best methods of manufacture. It has often happened that a topic of common interest has been as useful to the many as an abstruse one necessarily confined to the few, if not actually to specialists; so that, though we may have to confine ourselves to trifles, yet it has been found worthy of record that Michael Angelo said: "Trifles make perfection; and perfection, let me tell you, is no trifle." It is with this hope I venture to make a few observations to this important Institution.

There are various methods for the disposal of ammoniacal liquor obtaining among us. We have, for instance, in small works in country places, the system of simply running the liquor, or "gas water" as it is termed, into ditches, drains, or anywhere else available. This may be safely described as distinctly primitive. There are others making an endeavour to save a portion of their ammonia, by a plant which would have done credit to antediluvian days, up to the time when the Ark was pitched within and without, but which is nevertheless a step in the right direction. Others have a properly designed and efficient plant for the manufacture of sulphate of ammonia, finishing with oxide of iron purifiers for the treatment of waste gases, and—— for the benefit of the Alkali Inspector. Some, in addition, have the further desirable equipment of a sulphur recovery plant. Others are concentrating their ammoniacal liquor, and disposing of it at a very high strength to the chemical manufacturers for the recovery of cyanogen. Some works are purchasing their oil of vitriol from the chemical manufacturers; while others are treating their own spent oxide, and manufacturing the sulphuric acid on the works for subsequent use. When the ideal method of purification in closed vessels is reached (concerning which Mr. James Stelfox, of Belfast, has placed the gas world under a large indebtedness for his exhaustive and valuable experiments), other arrangements will still remain to be made.

Those of us who had the privilege of inspecting the splendid gas-works upon the Continent at the autumn meeting of the Institution of Gas Engineers, must have been struck by the excellence of the sulphate of ammonia plants, as well as the cyanogen and tar distillation works. When one thinks of the splendid buildings and plant allotted to this portion of the works, one also remembers with somewhat of shame the holes and corners to which too often such plants are relegated in works in the United Kingdom. Fortunately, there is an up-grade movement among gas undertakings, to raise the more distinctly chemical departments to a higher position, rather than, as has too often been the case, of making them a sort of happy hunting ground for scrap iron, boshes, tanks, pipes, and other material almost worthless for any other purpose on the works or district.

In Huddersfield, we have Dr. Feldmann's system in operation; and it is certainly a most valuable one. Permit me to hurriedly glance through the process as illustrated in the diagrams. [See next page.] Others will be able to improve upon the description to our mutual benefit, should they desire. Referring to the diagrams, it will be seen that the ammoniacal liquor is pumped from the storage wells into the tank or reservoir A, from whence it gravitates to the superheater B, in which it is heated by the waste gases from the saturator H. From thence, it flows in a continuous stream into what may be termed the free ammonia still C. It here falls from one small tray T to another; being constantly exposed to the hot gases and steam given off below, which are passing upwards. After passing the trays, it falls into the lower portion of the still, where milk of lime is forced in by the pipe E from the mechanical lime-mixer F; and steam enters through the pipe O. A great deal of the fixed ammonia is here given off; but to further secure the whole of it, the mixed lime and ammoniacal liquors are once more caused to pass down another series of trays in the fixed ammonia still D, where a further supply of steam is admitted by the pipe O; the effluent liquor passing away by the tap W into the drain at bottom.

The above is the ordinary course of the liquor. The steam from the boiler passes along the pipe O; where it is governed down from the boiler pressure to about 10 lbs., at which it enters the stills C and D as indicated. The ammoniacal and other gases evolved in the stills C and D pass along the leaden pipes into the saturator H, in which they come into intimate contact with sulphuric acid of a strength of between 54° and 58° Twaddel. From the acid tank P, a charge is run into the saturator H at about 150° Twaddel, and is reduced to about 70° by water from the tank R. In the saturator, the ammonia gases neutralize the acid, which thereupon deposits its crystals at the bottom—$2NH_3 + H_2SO_4 = (NH_4)_2SO_4$. These crystals are removed either by a scoop, ejector, self-discharging apparatus, or any other approved means.

The importance of using clean water for reducing the sulphuric acid is apparent, if the colour of the salt is to be good. It is also most desirable that the saturator is kept as free from salt as possible. The gases not absorbed by the acid pass away by the pipe J, through the acid arrester K, into the superheater B, where they impart some of their heat to the inflowing liquor. They then pass through the tube condenser L and coke scrubber M, and onward to the oxide purifiers N, there diffusing away into the atmosphere. In many works, the waste gases pass through sulphur recovery kilns and plants.

The essential constituents of a sulphate of ammonia plant are simply a suitable still—Coffey or other—in which the ammonia is liberated from its solution and salts; and a saturator, in which the acid receives the vapours given off. As you are aware, the designs of such are numerous; while the systems in use are intermittent or continuous. The whole working consists of first charging the saturator with reduced sulphuric acid of about 70° Twaddel strength; and when sufficient ammoniacal gases have passed through, the crystals begin to deposit at the bottom, from where they are removed by the attendant. But there is a further change taking place. The acid used is gradually becoming weaker and weaker; and this has to be noticed, and its strength kept up by the addition of further strong acid as required. This is ascertained by the use of a hydrometer. When the acid in the saturator sinks to 54° Twaddel, it is replenished and made up to 58°. The salts removed are placed upon a drainer S, consisting of a flat lead-lined sloping tray, overlapping one edge of the saturator itself, from which the mother liquor drains back into the saturator. The salt thus formed is, or should be, quite white when the crystals are thoroughly dried; but this is rarely obtained when the material has to be heaped upon itself to the depth of several feet. The store in which the sulphate is kept is lead-lined, having suitable draining channels leading to a receiver; the liquor so drained being again put into the saturator and re-used.

Several methods and systems have been adopted for making use of the waste gases; thereby saving the expense of their purification, and recovering the value of their constituents. A large quantity of the gas given off from the ammoniacal liquor is sulphuretted hydrogen. To recover the sulphur from these gases, requires a simple arrangement of sulphur kilns, &c. In the Claus patent apparatus, the sulphuretted hydrogen is made to pass with a regulated quantity of air, through a suitable kiln, in which oxide of iron is kept at a required temperature. The sulphuretted hydrogen attacks the ferric oxide, reducing it to the ferrous state in the form of sulphide, with liberation of water. But the air which is admitted at the same time also seizes upon the ferrous sulphide, and reconverts it to the ferric state again, with the result that the oxide is revivified, and the sulphur liberated in the free state. This sulphur, at the temperature of the kiln, assisted by the heat evolved in the reaction, is carried forward and deposited in the cooling chambers which follow. This is undoubtedly a splendid method; the principles which direct it underlying every endeavour to avoid waste, and the theory that everything produced has a value which might pay for recovery, even if it does not do more. There is also the important factor of the total abolition of nuisance arising from the dispersion of the waste gases into the air—a necessary condition in a crowded neighbourhood.

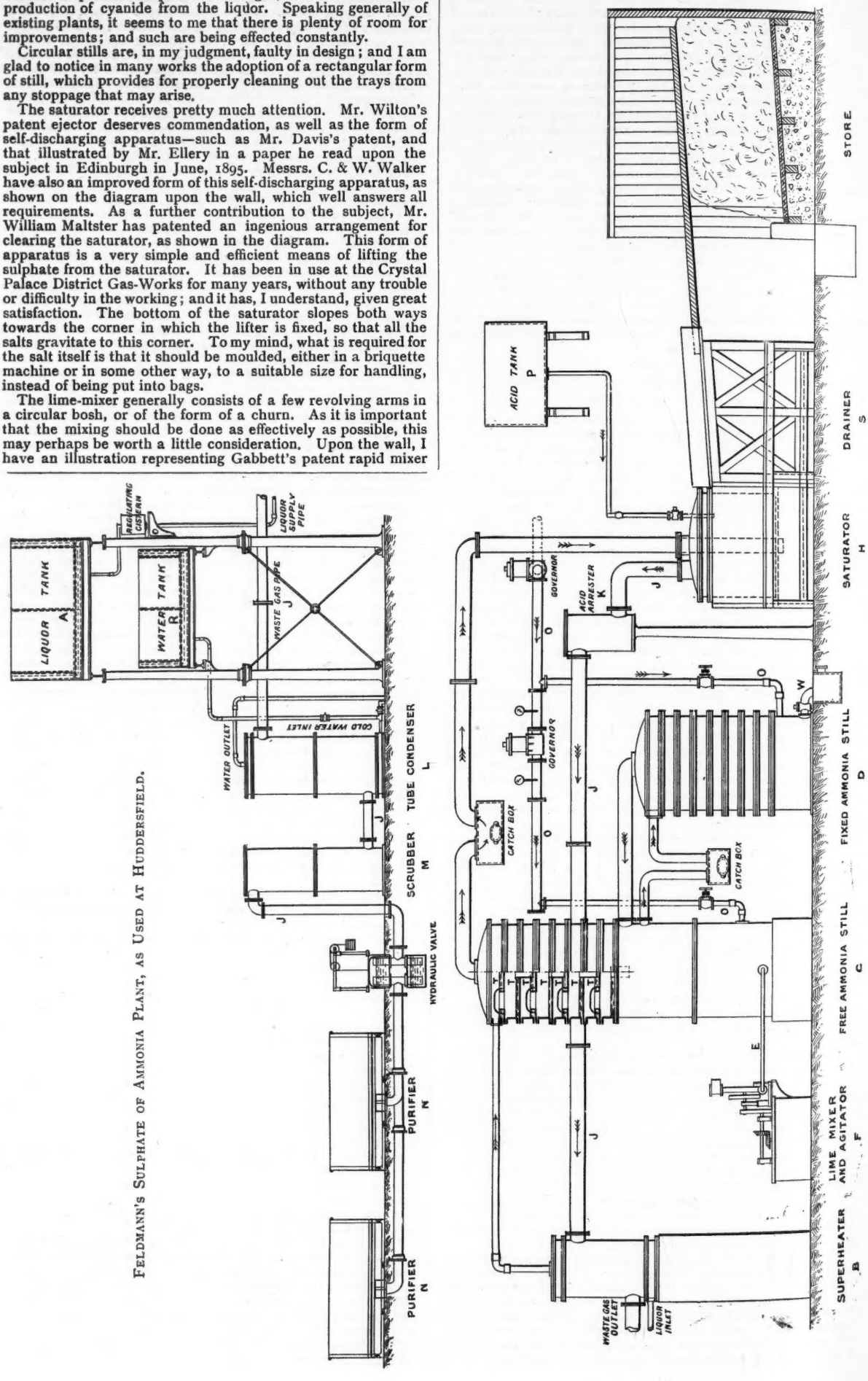
With regard to the waste liquor after the abstraction of the ammonia, various methods have been patented for recovering the cyanides as a further source of profit. Roughly speaking, they consist of modifications of combining the cyanides with iron salts; the liquor running from the stills being cooled in tanks, decomposed with iron salts, and the supernatant liquor strained and precipitated in the form of a copper compound by copper salts. In such processes, use is made of the waste gases given off for various purposes. The sulphuretted hydrogen is employed

to form ammonium sulphide; and it is further burned in suitable burners to produce sulphurous acid gas, which is used in the production of cyanide from the liquor. Speaking generally of existing plants, it seems to me that there is plenty of room for improvements; and such are being effected constantly.

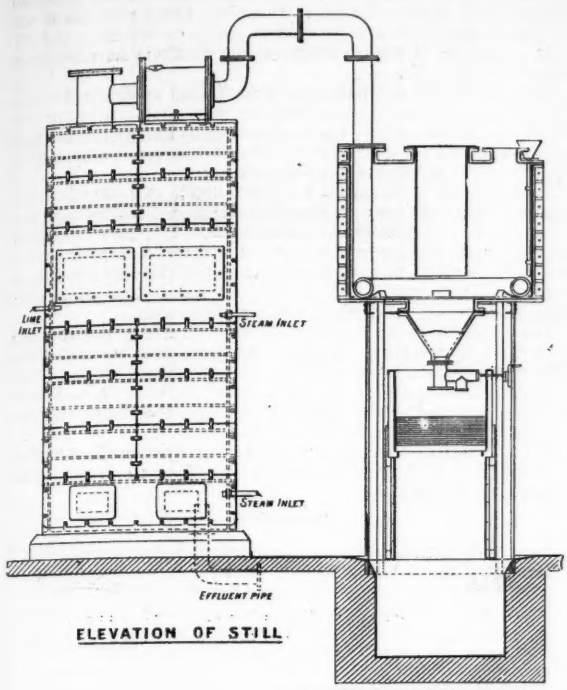
Circular stills are, in my judgment, faulty in design; and I am glad to notice in many works the adoption of a rectangular form of still, which provides for properly cleaning out the trays from any stoppage that may arise.

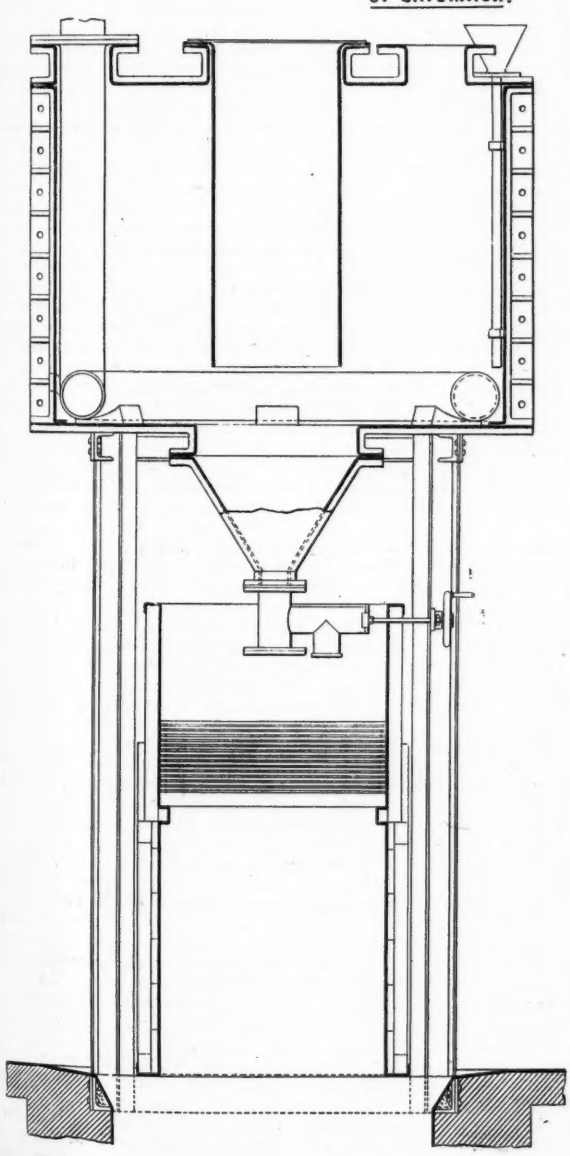
The saturator receives pretty much attention. Mr. Wilton's patent ejector deserves commendation, as well as the form of self-discharging apparatus—such as Mr. Davis's patent, and that illustrated by Mr. Ellery in a paper he read upon the subject in Edinburgh in June, 1895. Messrs. C. & W. Walker have also an improved form of this self-discharging apparatus, as shown on the diagram upon the wall, which well answers all requirements. As a further contribution to the subject, Mr. William Maltster has patented an ingenious arrangement for clearing the saturator, as shown in the diagram. This form of apparatus is a very simple and efficient means of lifting the sulphate from the saturator. It has been in use at the Crystal Palace District Gas-Works for many years, without any trouble or difficulty in the working; and it has, I understand, given great satisfaction. The bottom of the saturator slopes both ways towards the corner in which the lifter is fixed, so that all the salts gravitate to this corner. To my mind, what is required for the salt itself is that it should be moulded, either in a briquette machine or in some other way, to a suitable size for handling, instead of being put into bags.

The lime-mixer generally consists of a few revolving arms in a circular bosh, or of the form of a churn. As it is important that the mixing should be done as effectively as possible, this may perhaps be worth a little consideration. Upon the wall, I have an illustration representing Gabbett's patent rapid mixer



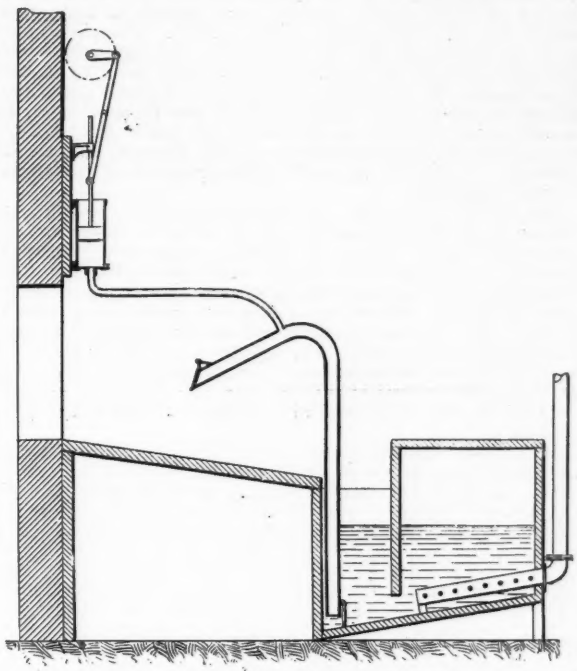
FELDMANN'S SULPHATE OF AMMONIA PLANT, AS USED AT HUDDERSFIELD.





WALKER'S STILL AND SELF-DISCHARGING SATURATOR.

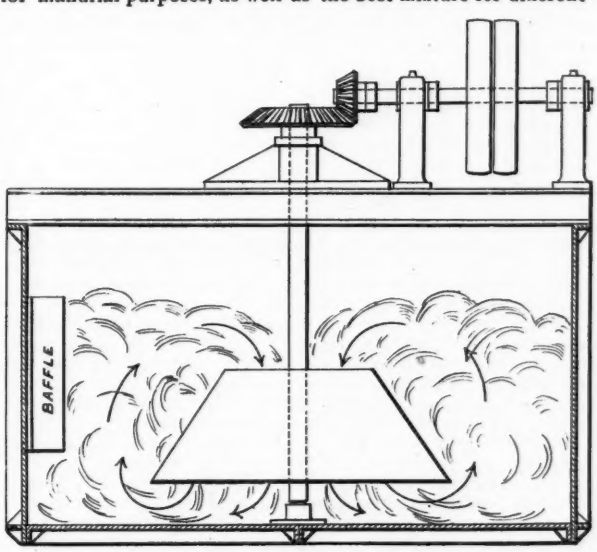
manufactured by Messrs. Young and Co., of Pimlico; and upon the table there is a small model of the same. Though this form of mixer was originally designed for sewage tanks, and is largely used for this purpose by the London County Council and other undertakings, yet it is suitable in every respect for lime mixing—or, indeed, for any other purpose where rapid and perfect mixing is desired. The ingenious change-valve for the purifiers made by Messrs. C. & W. Walker, concerning which the Alkali Inspector spoke so highly in his last year's report, is well worthy of adoption.*



MALTSTER'S PATENT SULPHATE LIFTER.

Directly or indirectly, all gas-works are concerned in the manufacture of sulphate of ammonia; and it is a common question as to how small a works it pays to put up a plant for. My own conviction is that there are no works too small for a plant of some size or other to be profitably worked.

As regards the market for sulphate of ammonia, we have, as has often been pointed out, by the distribution of gas-works all over the kingdom, as splendid an organization as could be desired for bringing under the farmer's notice the qualities of sulphate for manurial purposes, as well as the best mixture for different



GABBETT'S PATENT "RAPID MIXER."

kinds of soil. What it seems to me is lacking is a central authority, advising as to the position of the market and disposal of stocks, from whom the best possible information upon any matter connected therewith might be obtained. I would suggest, further, that some arrangement for analyzing different soils might be advantageously employed. A farmer might take an average quantity of soil from all over a large field, mix the same, and send from the mixed bulk a small sample to the gas

* This change-valve was described and illustrated in the "JOURNAL" for June 8, p. 1296.

manager, who might then forward it to such central station for analysis, and advise accordingly. In many cases, the analysis would show it to be deficient in nitrogen, and sulphate of ammonia could be recommended. In instances where it was apparent other food was required, the fact could be honestly stated.

If I may be allowed to digress from the immediate subject of the paper, I would say that what is needed for gas interests generally, in face of the competition to which they are subjected, is a National Institution in London, having a hall suitable for association meetings (without having to beg for one), together with a reference library, reading-room, secretarial and other offices, laboratory, and correspondence room. It might also be available as the offices of all the London Gas Institutions and kindred societies, and could contain a show-room of stoves, burners, &c. Such a central station might be built and maintained by annual contributions from gas undertakings. It would form a rendezvous and centre for gas engineers from every part of the world, when visiting London, and would prove, I am confident, a considerable acquisition of strength to the gas profession.

Mr. Carulla, of Derby, recently suggested an alteration in the name of sulphate, as being likely to be an improvement. One would think, "a rose by any other name would smell as sweet." Yet, on the other hand, it would not be the first time in the history of a trade that a change of name has had a beneficial result. Certain it is that distinctive names have a charm. His suggestion that "ammonium sulphide" should be adopted, deserves attention. To the commercial world, it involves no real change; while prominence is given to the ammonia idea in preference to the sulphur. Too often farmers connect the idea of sulphur with destruction, rather than with growth.

It is likely something more might be done in the way of selling manures mixed ready for use, but for the extra cost of carriage. Here is the great anomaly. While we are exporting sulphate of ammonia containing 20 per cent. of nitrogen, we are importing nitrate of soda containing only 15 per cent.—or of 25 per cent. less value, and necessarily at 25 per cent. increased cost for carriage bulk for bulk alone. The mixture of prepared manures might be extended advantageously for amateur gardeners, &c., but would probably not amount to much.

It is a question as to whether we give as much attention to the sulphate of ammonia market as we ought, considering the extent to which gas-works alone are responsible for its production. The subject is one which will claim further consideration at regular and frequent intervals. We receive advices now and again from different brokers, informing us of the state of the market, or possibly the absence of any market worth naming. At intervals we peruse pamphlets upon the subject; but rarely do we, individually or collectively, undertake research or experimental work. We have an article of intrinsic value, which we are producing, and are compelled to produce; and yet for many years we have allowed ourselves to be almost ousted from the market by an inferior competitor. Chemically we know it is one of the best nitrogenous manures; but practically we have not given it the attention it deserved. Thanks, however, to the efforts of Colonel Sadler and Mr. W. G. Blagden, the Sulphate of Ammonia Committee in London are now energetically taking the matter up; and backed by individual members of Institutions such as this, good work must undoubtedly follow. The time is singularly opportune. With the break up of the Nitrate Combination, and other complications ensuing therefrom, sulphate of ammonia has now a chance to step into the breach and exert its utmost influence to prove its genuine merit. It is a singular coincidence that an improvement of the market is taking place with the operation of the Committee. I will not enter into the manurial side of the question, except to remark that soils require some dozen different kinds of food—such as oxygen, hydrogen, nitrogen, carbon, sulphur, &c., &c. Our particular interest is in nitrogen; and this will be dealt with later on in a far abler manner than I can possibly attempt.

Much has been done, but much still remains to be done, to educate farmers and agriculturists to a knowledge of the value of artificial manures; and it is for us to take our part in disseminating information respecting the product which we have always available. If each member would make it his duty to secure the co-operation of one farmer per annum, an immense stride would be made in a year or two in the development of sulphate of ammonia for manurial purposes at home. A splendid example has been set us in Jersey by Mr. Joseph Morris, the respected Engineer and Manager there, the results of which were ably set forth in Mr. Ritson's paper read a few years since before The Gas Institute. But we must bear in mind that Jersey is peculiar as to the use of artificial manures; some £60,000 a year being paid for the various ingredients. The land is dressed so very heavily that three crops per annum are usual. While we cannot, of course, expect such results as these, yet an improvement may be looked for, and not in vain.

While the majority of us are conversant with the fact, allow me just to remind the younger members of our Institution that ammoniacal liquor is much more effective in extinguishing fire than water.

The output of sulphate from gas-works, owing to the rapid adoption of water-gas processes, from which no ammonia is obtained, is unlikely to increase. In America, this displacement of coal gas has reached an enormous extent, and will probably increase still more. There is, however, every prospect of an increasing supply from those large iron, carbonizing, and oil works, in some of which hitherto bye-products have not been properly dealt with.

The quantity of sulphate per ton of coal carbonized varies according to the methods of working and coals used; but it is considered good work to obtain between 25 and 30 lbs. per ton. In chemical works, where the quality of the gas is a secondary consideration, far more than this is secured.

There is one little detail I should like to call attention to—that is the importance of seeing that all the seal boshes upon the works have perfectly tight lids and covers. The loss of ammonia resulting sometimes upon the top of a retort-bench, or from a sealing-bosh fixed on a wall or in an out-of-the-way position, is small, but at the same time worthy of note. Everything containing ammoniacal liquor should be sealed up.

The importance of having sufficient scrubbing power is too apparent to emphasize. In the summer months, we hear of the difficulty experienced in keeping the scrubbers clean. This staining, though slight, of course involves loss. A periodical test for the soundness of liquor storage-tanks would ensure that loss was not arising in this direction.

If the result of this paper produces an increased interest in the subject of it, I shall feel amply repaid for the little trouble taken in its preparation.

Discussion.

Mr. Isaac Carr said he had listened with very great interest to the able paper which had been read by Mr. Harman; but at the same time he confessed to some considerable feeling of disappointment. When he received the programme, he saw they were to have a paper from Mr. Harman entitled "Ammonia." But when he took up the paper that afternoon, he saw the title of it had been changed to that of "Sulphate of Ammonia;" and in this lay his disappointment, as there was so much about ammonia that they did not understand. When he saw the title of the paper, he hoped that Mr. Harman was going to tell them how to get the cyanogen from the gas, and convert it into ammonia. He did refer to it; but he did not tell them how they were to do it. The matter was one of very great importance to all gas engineers, because they were losing the ammonia passing away in the form of cyanogen in their waste liquor; and they were losing it again in letting it pass over the scrubbers into the purifiers. They sometimes heard people say who had bought oxide of iron from them, that they liked it because it contained plenty of cyanogen. This, of course, was ammonia; and it did not pay them to sell it in the form of cyanogen. While speaking on this subject, he might say that he had been working at it himself, with, he confessed, very unsatisfactory results up to now. But he trusted other members would take it up; and if anybody could find out a way of disassociating the cyanogen and converting it into ammonia, he would confer a very great boon on the profession. With regard to the plant which had been described by Mr. Harman, of course they were all familiar with it; and it was a very excellent plant all round, with one exception, and that was the heater. He could not understand why makers of sulphate of ammonia plant should allow gases to come off from a saturator at a temperature of 500° to 600°, allow it to pass through a heater that was practically little more than a toy, and then have to put in condensing power in order to reduce the heat before the gases could be passed on to the purifiers for absorption. There were many excellent arrangements in the market; and it was possible, by enlarging the heater, not only to reduce the cost of working by economizing enormously in the steam, but by the long continued boiling that could be obtained in a larger heater to increase the yield of sulphate of ammonia.

Mr. J. Wilkinson (Drighlington) said Mr. Harman had referred to some of the systems as dating back to the time of the Ark; but he must protest against the old intermittent system being put in that category. He was rather disappointed that no reference had been made to the disposal of the effluent liquor, as many of them had been lately troubled with visits from a gentleman termed a Rivers Board Inspector. It was a question rapidly coming to the fore; and, before very long, they would be prevented from turning the effluent into the streams. If this were the case, the question would arise what was to become of the effluent from the sulphate plants. Diagrams had been exhibited of the constant system, which might be a very good method for getting all the ammonia out of the gas, but it increased the effluent liquor to 10 per cent.; whereas the old intermittent system reduced it to one-third. If the authorities decided not to allow gas-works to turn the effluent into the streams, the constant system was doomed. In discussing the different types of stills, the question arose—what percentage of ammonia was contained in the spent liquor. Not only had they spent liquor which contained less ammonia, but they had twice the amount of effluent liquor to deal with in an intermittent still as with a constant one. Mr. Harman said it was considered good work to obtain from 25 to 30 lbs. of sulphate per ton of coal carbonized; but personally he was not content unless he obtained 34 lbs.

Mr. Isaac Carr wished to ask if Mr. Harman could tell the meeting the amount of ammonia the heater took out of the liquor in passing through, as this would be a good test of the

ammoniacal liquor, and also the temperature of the waste gases as they left the heater.

Mr. H. Townsend (Wakefield) said he was not making sulphate of ammonia now, but he had had experience with most of the apparatus illustrated by the drawings. Mr. Harman stated in the course of his paper that Claus's sulphur-recovery plant was a perfect system for preventing nuisance; but he was sorry to say that his experience of it was not so favourable, for, while it recovered the sulphur in a very admirable manner, the sulphuretted hydrogen and the sulphur in other forms had an unfortunate habit of getting through the brickwork. He did not know whether this was due to rather inferior kind of work, or whether Mr. Harman's experience had been more happy than his own. He had tried all the schemes he could think of to make the apparatus efficient, but had been unable to succeed. He quite endorsed Mr. Isaac Carr's remarks that the superheater was made ridiculously small. It struck him that the waste heat from the saturators was not recovered as it ought to be, and that a very considerable amount of reducing power was necessary to bring the gas to such a state that it could be dealt with by the sulphur-recovery plant. Then he had had experience in dealing with the gas by means of oxide purifiers; but it was not very happy. They always threw off a certain amount of sulphuretted hydrogen. He had been much interested in what had been said about the effluent, which was certainly a very important matter. The spent liquor from the sulphate of ammonia plant was very large in volume, and very difficult to dispose of; and, of course, now that the new practice on the part of the Rivers Board was being pursued, it was certainly a matter that would require very great consideration by the conductors of gas undertakings who made their own sulphate of ammonia. There was a system by which the effluent was rendered innocuous; but he could not at the moment remember the details. This was a matter that would have to be carefully looked up and improved. He believed the effluent could be so treated that it would be acceptable to the Inspectors of the Rivers Board; but, anyhow, if it were not, the difficulty would have to be dealt with in the future. The valve referred to by Mr. Harman was no doubt of great utility; and every works in which sulphate of ammonia was made ought to adopt one.

Mr. S. Meunier (Stockport) wished to ask Mr. Harman if he had tried anything with regard to the cyanogen compounds in the liquor, because they knew there was a large amount of sulphocyanide which it was possible to recover. It had not yet been done on a working scale; and therefore he should like to know if Mr. Harman had studied this point, and made any experiments. He (Mr. Meunier) had never had an opportunity of trying anything with regard to the sulphocyanides.

Mr. T. Duxbury (Middleton) also wished to thank Mr. Harman for his paper. His first thought on looking at the drawings was as to the size of the heater. He happened to have had experience with two different sizes of heaters for the same sized plant. The first was proportionately of the dimensions shown. But the one they had erected at Middleton was perhaps double the size; and they were enabled to pass very considerably more liquor through the stills, and obtain more ammonia per ton of coal with practically similar coal and washing. Generally speaking, the size of the heater was far too small. He forgot the actual temperature at the outlet of their heater; but he could easily bear his hand on the pipe at the outlet, which to his mind proved that their heater and purifier would do more work because they did not require to have any condensation before entering the purifiers. With regard to the change-valve, they had one which answered its purpose remarkably well. It had one inlet and two outlets—one to each purifier. The time occupied in changing the purifiers was only a few seconds. They had no puffs of sulphuretted hydrogen, and could not desire to have anything better than the arrangement they had, which was very cheap and easily made by anyone. They had also a draught from their purifiers to the chimney—a 6-inch pipe, to draw the air down through the oxide of iron; and it was very rarely indeed that they emptied a sulphate purifier, perhaps not more than two or three times a year, though they made 100 tons of sulphate per annum. With reference to the self-emptying arrangement of the saturators, he had had one of Wilton's dischargers, and had come to the conclusion that, at a small works where they were compelled to have a man in charge who could do the work easily, they did not gain much by a discharging or self-emptying arrangement. When they fixed their saturator with the discharger, their men looked after the sulphate plant; but it was very useful during the time they had two jobs to look after. Eventually they changed, and they had men now purposely to attend to the sulphate plant; and they had to be there. It was only a matter of lifting half a ton of sulphate in twelve hours. He found that the saturator worked better without the discharger and without going to the extra expense of fixing it. For larger works, where 2 or more tons of salt had to be lifted each day, a discharger or self-emptying arrangement would be advantageous. His Wilton discharger had always worked satisfactorily. Like other speakers, he was a little disappointed with the paper when he saw the title, as he hoped to hear something about ammonia—not that too much had been said about sulphate; for the more they discussed the matter, and brought it before the farming public particularly, the greater the benefits they would derive from its sale.

Mr. Harman, in reply, wished first to disclaim any responsibility for the alteration of his title. When he was asked for a paper, he certainly said "Sulphate of Ammonia;" but somehow the title was changed. He had not had any experience with cyanogen plant; though what he mighthave to do later on, he was not then in a position to state. With regard to the size of the superheater, he was not responsible for the plant illustrated, which was erected by one of his predecessors. It was just a question whether they required the gases so very hot at that particular point; but he was not prepared to deal with that then. The question of effluent liquor was a most serious one. Upon this subject he felt like the examiner at a school who, when cornered by a pupil, threw the question at the class, and said: "Will any pupil like to answer that question?" In the same way he should like to throw this question at the meeting, and ask if any of the members would like to answer it. As to the sulphur-recovery plant, he was aware that there was a little nuisance arising from it; but the leaks in the brickwork were generally stopped by the sulphur itself. On going round a works once, and noticing the ammonia gas coming out of a storage-tank at a furious pressure, he found that it was due to running a steam-pipe through the storage-tank.

Mr. Mellor read the following paper, on

BILLINGTON'S PATENT METHOD OF DE-SCURFING GAS RETORTS.

The removal of deposited carbon in retorts is one of the difficulties which trouble the manager of a gas-works during the busy winter season. No one as yet has succeeded in preventing the formation of this deposit. We all know that high temperatures, and the hydraulic seal with its pulsations, soon cause a carbonaceous coating, with its attendant disadvantages of smaller retort-space and increase of fuel account, owing to the thickness of non-conducting substance between the retort and the charge of coal. Even when we have conditions most favourable to the non-deposition of carbon, the deposition still occurs; and the necessity for its removal still remains.

The result of the making-up of the retorts is in some cases deplorable. In taking down settings in many places, thick blocks of carbon are not unfrequently met with. Depositions of carbon inches thick, and the full length of the retort, are not uncommon; resulting in a very serious loss in working results. Almost every manager must occasionally drop the working of the settings, in order to burn off the carbon or scurf, and finish the process by the use of bars to detach what remains after several hours loss of time. The retorts, after this treatment, are more or less leaky; they require patching, and are not up to standard work for a day or two. This process of getting rid of the carbon is troublesome; and several methods have been suggested for effecting its removal.

One of the earliest of these was the employment of a steam-jet, inducing a current of air into the retort, and causing a more rapid combustion of the scurf. Almost invariably, this brings down the heat of the retort; and from this cause, the process is little used. Another plan suggested is the use of water spraying at the end of a hollow bar, which is sharpened to remove the carbon.

Failures in this and other directions led to the adoption of another method at the Longport Gas-Works, which gives complete satisfaction, and is applicable to any works, large or small. At these works, an old exhauster of 20,000 cubic feet per hour capacity has been placed in a building adjoining the retort-house, and is connected by belting to an engine that works the coke-crusher. The inlet of the exhauster is protected by a finely perforated zinc hood to prevent admission of dirt or grit. The outlet is connected to a 6-inch air-main. This is taken to the retort-house, up the side of the retort-house wall, and along the top of the benches just behind the ascension-pipes; and from this main, branches of 3-inch wrought tube are brought down by the side of each setting of retorts, fitted with 3 in. by 2½ in. tees, which are placed a little under the level of each tier of retorts. These tees are closed with plugs; and whenever any particular retort is to be cleaned, the plug is removed and a nipple inserted, one end of which is tapered so as to enable the coupler of another tube to slip easily on it. The exhauster is put to work; and a blast of 20 inches water pressure is obtained. By means of two bends and a length of pipe, the blast is sent into the retort after the withdrawal of a burnt-off charge. (I may say, in passing, that the retorts chiefly experimented upon have been singles; the through retorts at Longport having been stopped in the middle for convenience of working.)

The air-pipe is placed 2 or 3 feet within the mouthpiece; and the blast is sufficiently forcible to sweep the whole length of the retort, impinge on the back, and return along the top and upper sides. Carbon is immediately sent out in a shower of flakes and sparks, and in twenty minutes is ready for the bar for detaching. Some 2 cwt. of carbon has been detached from a retort in 35 minutes; the retort being left perfectly clean and ready for re-charging. This was the accumulation of two months' working. It is advisable to use the blast more frequently, as by so doing the use of the bar is altogether dispensed with, which is far preferable. A week's deposit can be removed in 15 minutes; a fortnight's, in about 30 minutes; three weeks', in about an hour—leaving the retort perfectly clean, and without the admission of any tool for detaching the carbon.

The process described applies to closed retorts. For through retorts, a different method is adopted. The air-pipe in this case is almost closed at the end; and the air issues from a row of holes on each side, and extending 3 or 4 feet along the side of the tube. The blast cuts into the carbon laterally. When the first half of the retort is cleaned, an additional length of pipe is screwed on, and the remainder of the retort is cleaned in the same manner.

Since the adoption of this plan, there has not been any trouble with retort carbon. For more than twelve months, a charge has not been missed through the de-scurfing of the retorts. As the retorts are worked six-hour charges, it is only necessary to draw a retort half an hour before the usual time, put the apparatus to work, clear the retort, and it is ready in an hour for another charge. The process, instead of cooling the retort, leaves it as hot as, or hotter than, at the commencement of the blast; the 5½ hours remaining are quite sufficient for the burning off of a complete charge. The results have been a continuous make of 8000 to 9000 cubic feet per mouthpiece every 24 hours for months together. There has not yet been time enough to see how much the life of the retorts has been lengthened; but there is not a doubt that the abolition of the bar solely in scurfing will considerably lengthen the period during which a retort can be worked with advantage.

Discussion.

Mr. W. Hutchinson (Barnsley) said one passage in the paper which had attracted his attention was where the author said: "We all know that high temperatures, and the hydraulic seal with its pulsations, soon cause a carbonaceous coating." It had often occurred to him that the pulsation was the thing that determined a good deal of the deposition of the carbon in the retort. He should be glad if they could elicit the information from any member present who had had the opportunity of testing this—that was to say, one who had the retorts in which there was no seal, and also those in which a hydraulic seal had been in existence; and it would be useful to have the benefit of his experience with regard to the pulsation. No doubt the general practice had been to use a scurfing-bar, which had some points in its favour. The account given in the paper seemed to be very good so far as the results went; but it struck him the appliances were a little bit cumbrous for the work to be performed. He did not know whether a flexible tube would be more convenient than pipes laid on in the regular fashion; but it seemed to him, just at a glance, that it might be.

Mr. R. G. Shadbolt (Grantham) thought the paper, though short, was very much to the point, and of great interest to gas managers when they were doing all they could to extend the life of their retorts. He considered that no part of their apparatus was so badly handled as the retort. To many of them whose works did not possess an exhauster of the capacity stated in the paper, it was a very cumbrous system. He should like to ask Mr. Peaty whether a light, cheap, almost portable fan would not be equal to the work.

Mr. Meunier said he had had the opportunity of seeing this process at work at Longport; and certainly all that Mr. Mellor had said with regard to the plant was perfectly true, and the results were remarkably satisfactory. There was no diminution in the heat; and the scurf was got off very quickly. But at the same time it did appear to be a little cumbrous to have the 20,000 cubic feet per hour exhauster, and all the various pipes; and when they went into the question of cost, he found that the capital outlay was very heavy. The point was, would it be worth while—would they get sufficient saving in the life of the retorts, and the diminution of time taken to do the work? As regarded the practical working results, it was one of the best things he had seen; but he was not quite sure whether it would pay them to adopt it.

Mr. Isaac Carr said he did not quite understand the reference to the periods at which the carbon should be removed from the retorts. The author told them that a charge of so much carbon could be removed in so many minutes; but they had yet to learn that there was any fixed time for the carbon to gather on the retorts. He thought, if they all gave their experiences, it would be found they all differed, because it was a fact that there were no two works precisely the same. There were some works in which there was very little trouble with carbon; while in others it was a very great bugbear.

Mr. Mellor remarked that he referred to the Longport works, and not to works generally.

Mr. Isaac Carr (continuing) said with regard to the introduction of machinery in the retort-house, it was always objectionable if it could be done without. It was suggested in the paper that an exhauster should be used. Mr. Shadbolt asked if a fan would not answer the purpose equally well; but, in his opinion, both were objectionable. It occurred to him to ask if the same result could not be obtained by a steam injector, because this would simplify the matter very considerably.

Mr. G. Niven (Clayton), like Mr. Carr and Mr. Shadbolt, could not see the advisability, on the point of cost, of introducing in the retort-house an exhauster, with a cumbrous combination of piping laid above the retort-bench, and brought down by pipes to underneath the mouthpieces, and fixed in such a manner and position as would best enable them to bring the apparatus into useful contact with the carbon to be removed. He had seen recently at Waltham Abbey a system of scoop-charging, which he was about to introduce into his own works; and the Engineer there also kindly showed him his system of removing carbon from retorts. He was reminded of this when Mr. Carr asked the question whether the amount of air required in burning off the carbon in the retort could not be supplied by a steam-jet. He thought he was correct in stating that the oxygen required for the purpose could be obtained by the introduction of a steam-jet, and also that they would very nearly, if not altogether, approach the oxy-hydrogen blow pipe. There should be an intensity of heat, together with an excess of oxygen, to bring about the destruction of the carbon on the retort. He was satisfied, in his own mind, that this was a system that might readily be introduced into retort-houses with much profit, and with a saving of time and labour to the men.

Mr. Wilkinson asked if it was possible to allow a single retort to go until 2 cwt. of carbon accumulated, as this would mean 6 inches in the width of the retort. In a 24-inch retort, they would only be working at three-fourths of its maximum. In his opinion, it would scarcely be possible to go on working with 3 inches of carbon on either side of the retort.

Mr. Burtonshaw said his father adopted a plan which he thought very sensible and practical, and which dispensed with all question of an exhauster or any other apparatus. One day a month they would lay off a certain number of retorts; and with the retorts, taking off the top of the H-pipes, he would revivify his spent lime. They found that in a very few days, without much harm to the retort itself, they would remove the carbon and clear out the ascension and H pipes.

Mr. H. Peaty (Burslem) wished to refer to what had been said in the way of objection. Mr. Hutchinson had asked for some data from other people who had tried retorts in which pulsation had been remedied. He did not know of any himself, except at Cheltenham, where they simply used valves, and a steam-jet exhauster to draw it at almost hair-breadth gauge; and there could not be much carbon in retorts under such conditions. Where there was no carbon deposited, of course no means were required to remove it. The next objection was that the apparatus was cumbrous. He confessed that it was not the thing he himself should have liked to put up, if he could have found anything else; but the deposition of carbon was very heavy with them, and they wanted a means of shifting it somehow. But, if he could have procured a small dynamo with a portable fan attached, and placed it in front of the retort, there would have been no 20,000 cubic feet an hour exhauster at work and 6-inch mains. If electricity could be obtained at his works, he should be very glad to try the method of using a small dynamo and fan. He had found that a week's deposit could be cleared in fifteen minutes by sending a current of air into the retort. A steam-injector had been suggested by Mr. Carr; and this he believed had been named by Mr. Billington as an alternative to the exhauster. He had not seen the steam-jet employed at Waltham Abbey; but he should doubt if it did the work as thoroughly as the direct air blast. He had never found satisfactory the introduction of steam into the retort, as it brought down the temperature. The deposit of carbon in retorts was very unequal. In the case Mr. Mellor saw, it was 3 inches thick at one particular place. As to the method suggested in connection with spent lime, people who were not regenerating it would not use this method at all. The principal objection to the appliance seemed to be that it was too heavy and cumbrous for so small a quantity of work; but he should continue using it until he found something better.

Mr. Isaac Carr said it would be interesting to know what a week's deposit of carbon was. The statement in the paper was very vague.

Mr. Peaty said about ¼ inch. Sometimes when it was more flakey it might be even more than that, but ¼ inch was swept out in about 15 minutes.

Mr. Niven asked to be allowed to correct what he had said in a material particular. He wished to say that the steam jet used for forcing the air into the retort was at the inlet end of the tube through which the air and steam passed, so that the heat generated by the tube dried the steam, and by this means they had no diminution in the heat of the retort.

Votes of Thanks.

Mr. T. Bower (West Hartlepool) then moved that the best thanks of the meeting be given to the authors of the papers.

Mr. W. H. S. Gendall (Bury) seconded the motion; and it was carried unanimously.

Mr. Harman, on behalf of the writers of the papers, tendered their thanks for the kind way they had been received.

Mr. Isaac Carr then proposed a hearty vote of thanks to the President for his conduct in the chair. He said he thought the way in which Mr. Porter had presided over the meeting commended itself to them all.

Mr. G. E. Stevenson (Manchester) seconded the proposition; and it was carried by acclamation.

The President said he was extremely obliged for the unanimous vote of thanks which had just been passed. It was a great pleasure to preside over such an excellent meeting, and to see so many familiar faces. He hoped the members present would endeavour to attend their next meeting in Manchester in February, when the President-Elect would take the chair, and support him by contributing to the transactions of the Institution during the coming year.

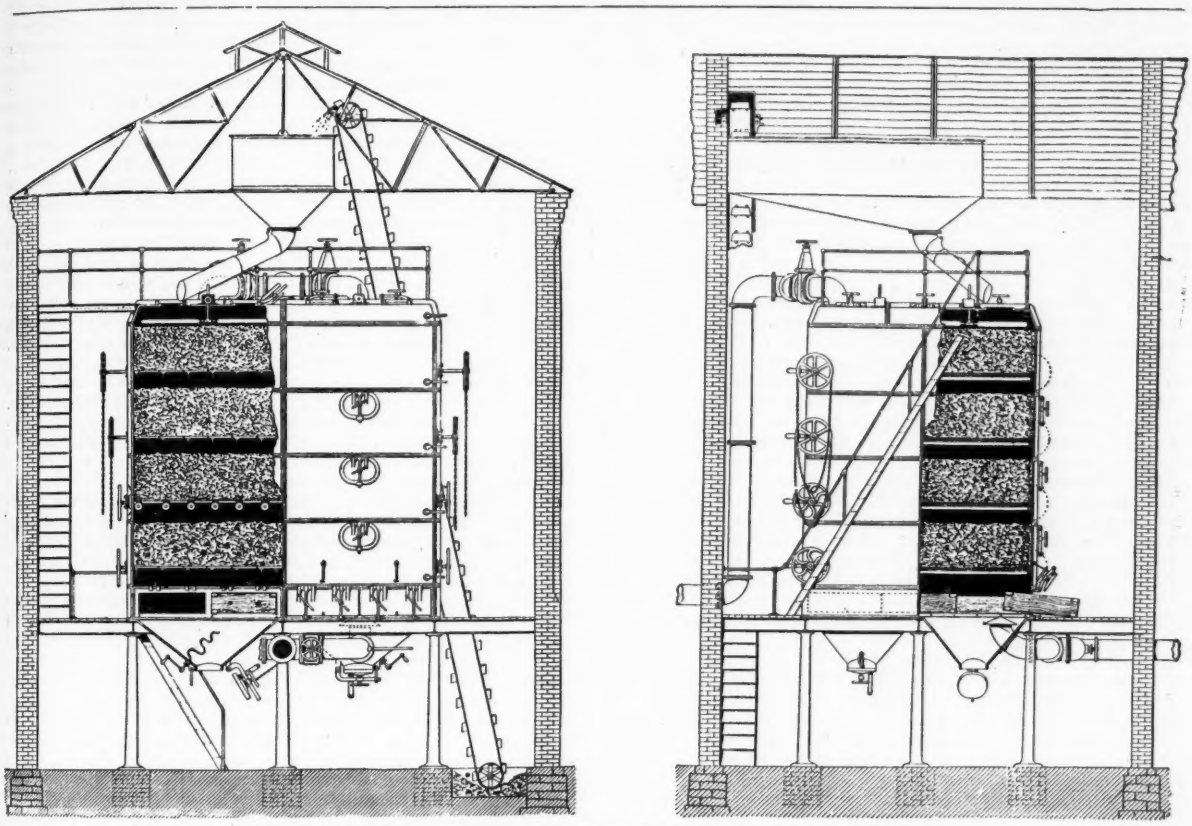
The members afterwards took tea together.

AMERICAN GASLIGHT ASSOCIATION.

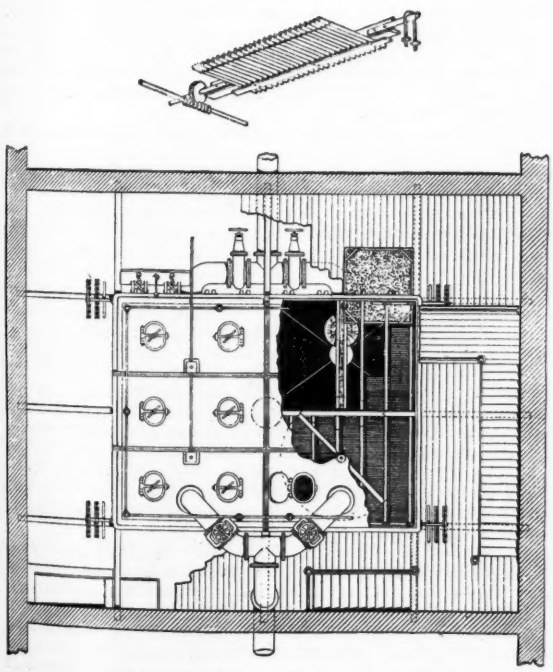
The Annual Meeting at Fort Monroe.

(*Continued from p.* 1116.)

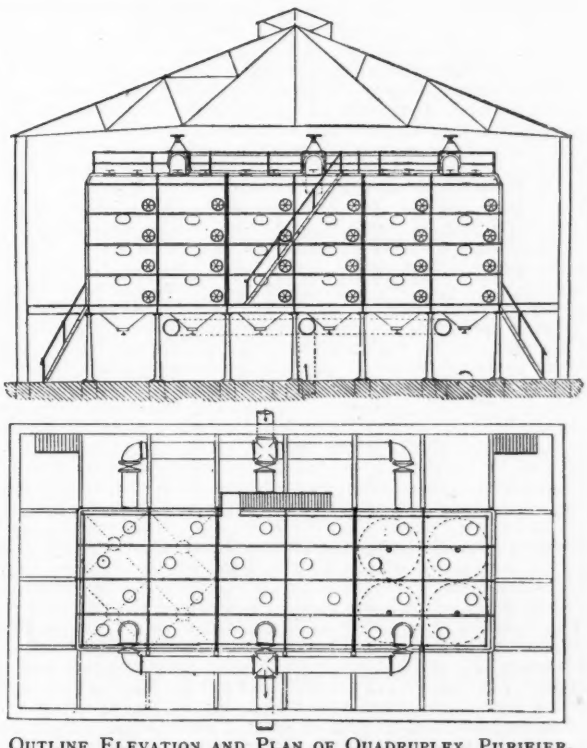
Mr. F. H. Shelton next read a paper entitled "A Quadruplex Purifying Box: Why Not?" The objections to the present system of arranging the purifiers were the large amount of room occupied, the expense of the covers, lifting arrangements, &c., both in respect to first cost and to wear and tear, the complication of the valves and connections required, and the difficulties connected with the water seal. He submitted a design that comprised four boxes in one, and therefore economized space, had no wrought-iron cover to lift and rust out, no water seal, and one-third the ordinary amount of connections, with only four plain gate-valves. The general scheme was based on the fact that oxide, unlike lime, did not cake, but would run and could be dealt with entirely by gravity; and therefore a removable cover for emptying was not necessary with oxide. He proposed to unite four boxes, one over the other, in one structure, thus forming one large box. The oxide would be delivered by gravity through holes in the top, automatically levelled and spread; and when foul it would be drawn out by gravity through hoppers in the bottom. He exhibited drawings of quadruplex boxes, respectively 12 ft. by 16 ft. and 18 ft. by 54 ft. in area,



Side and End Elevation of Quadruplex Purifier, 12 ft. by 18 ft.



Plan of Quadruplex Purifier.



Outline Elevation and Plan of Quadruplex Purifier, 18 ft. by 54 ft.

supported on columns, and having an overhead hopper with elevator. The filling and emptying doors were secured by screws and crossbars. The building was entirely above the floor, like an overhead purifier-house, but rather higher; and the floor was available for revivification, &c. The box contained four layers of grids, each carrying the equivalent in content of an ordinary single purifier, supported on hinged tee-bars that could be actuated from outside, so that when desired they could be caused to drop their contents to the bottom. Manholes for cleaning, arrangements for testing and taking pressure, &c., had all been carefully thought out; and the whole was divided vertically into two or more separate chambers, with inlet and outlet to each, so that one chamber could be isolated, emptied, and recharged without interfering with the operation of the others. There are several filling and discharging doors, according to the size of the vessel; and the overhead hopper is provided with moveable spouts. The spreading and levelling is affected by rotating blades, adjustable to any desired depth of oxide. In filling, a charge for one layer is served on to the top row, and passed down successively from one to the other to the bottom. The next layer is then served, and so on. When the bottom layer is foul, it can be discharged one division at a time; the remaining layers are passed down one; and a fresh charge is introduced on the top layer. This operation can be affected in such a short time that practically the whole of the box would be always at work, as there is no lifting to be done. The author had tested his ideas by constructing a working model, which could be efficiently operated. The quadruplex vessel would, of course, be heavier than an ordinary box; but it need not exceed the weight per square foot of a water-gas generator or a scrubber. If it was desired to use a layer of sawdust or other porous material at the inlet, the bottom of the vessel could be covered with shallow, grid-bottomed boxes of suitable size, which could be introduced through manhole doors made for the purpose. A similar plan could be resorted to if a layer of lime was desired. The boxes could be made of suitable size for wheeling about on a barrow or truck, and formed a very convenient way of dealing with the material. The system could also be used for revivification *in situ*. He claimed that the turning of the oxide as it was passed down from layer to layer, was a decided advantage; and the size, number of layers, shape, &c., could be varied as desired. Any suitable mechanical arrangement could be adopted for moving the grids, spreading the materials, &c. The absence of open seals or lutes that might freeze in winter, was a great advantage; and the cost need not greatly exceed that of single purifier boxes.

The discussion was not favourable to the proposition contained in the paper. Mr. Littlehales thought the only advantage was a saving of ground space; while the cost of construction would be at least twice as much as that of the ordinary system. Mr. Bredel, taking the purifying plant of the Universal Gas Company as an example, questioned the saving of ground space. He said that with old oxide the speed of the gas through the material should not be more than ¼ inch, but with new material it might be ⅜ inch. This gave an area of 575 square feet per million per diem, in large works, and 630 square feet in smaller works. At Chicago, they had four series of two boxes, each box 36 feet square. As each set had to deal with 2½ million cubic feet per day, this gave 576 square feet of purifying area per million. Each box contained 5 feet thickness of material, so the gas had to pass through 10 feet. Applying these data to the dimensions given in the paper, he showed that more space would be needed, and not less. The author proceeded on the assumption that a series of four oxide boxes were necessary; but the four-box system for oxide had seen its last days. He also talked of 3 feet thickness of material; but it was now usual to put from 5 to 6 feet in each box.

Mr. F. B. Wheeler, of Long Branch (N.J.), read a paper on "Rust Deposits in House Pipes," in which he remarked on the extraordinary quantity of rust that was sometimes found in fittings, mostly near to the meter-outlet. On overhauling the fittings of a large hotel, built about thirty years ago, he obtained a great quantity; and yet many of the pipes showed no sign of internal corrosion. Inspection revealed the presence of iron rust, naphthalene scales, white lead, grit, spongy lumps, and black oxide scales taking the shape of the pipe, which were detached by the hammering that was necessary to loosen the deposit. The whole was dry, dusty, and had a strong gassy odour. Careful experiments were conducted upon it; about 12lb. being available for examination. Exposure to a temperature of 180° Fahr. for several hours, showed a loss of only 2·1 per cent.; but on heating to a bright red heat for one hour, there was a loss of 30 per cent. Digestion in cold absolute alcohol showed a loss of 2·2 per cent., due to removal of naphthalene. The determination of sesquioxide of iron was effected by the Fresenius method—dissolving in hydrochloric acid, precipitating by ammonia, and carefully drying and igniting the residue—the result being 69·3 per cent. of sesquioxide of iron. The presence of sulphur trioxide was determined by boiling the hydrochloric solution with bromine, and precipitating by barium chloride. By this means, 3·5 per cent. was detected, and a further 1·23 per cent. of sulphur was obtained by treating the dried oxide precipitate with carbon bisulphide. Further experiments on other samples of deposit showed that the constituents were the same, but that their proportions varied. The sesquioxide ranged from 24 to 79 per cent. The naphthalene was sometimes as much as 11 per cent., particularly in small pipes at a distance from the meter; and moisture, carbon, &c., also showed a wide variation. The author next went in detail into the weight of iron present in the deposit, as compared with the loss of weight by corrosion of the pipes. He showed that there was more iron in the deposit than could have been furnished from the pipes, and accounted for the excess by assuming it to be due to iron carbonyl brought in by the gas. Finding from Berthelot that iron carbonyl was volatile at ordinary temperatures, but condensable to a liquid at 32° Fahr., he passed carburetted water gas through a coil of ½-inch glass tubing, immersed in a freezing mixture which kept the temperature at 0° Fahr., at the rate of 4 cubic feet per hour. The tube was carefully washed out with hydrochloric and nitric acid; and the mixed washings and condensed matter were neutralized with ammonia, and tested for iron by the potassium ferrocyanide process. About 6½ grains of iron per 1000 cubic feet of gas were obtained; and this result was substantiated by a second experiment, in which the temperature was kept at 32° Fahr. The gas used had been purified with rather stale home-made oxide; and it contained 14 per cent. of illuminants, 52 per cent. hydrogen and marsh gas, 27½ per cent. of carbonic oxide, and 6 per cent. of carbonic acid, nitrogen, and oxygen. These experiments proved that iron carbonyl might be decomposed and deposited, as naphthalene was, when the gas passed through a cold pipe. He calculated that the excess of iron in one of the pipes examined would represent the passing of 2 million cubic feet of gas; and that not less than 3 million feet had been delivered through the pipe since it was fixed. The usual temperatures ranged from 12° to 54° Fahr.; and he went on to show that the iron rust was probably deposited at a lower temperature than naphthalene. It was, however, quite possible for it to be thrown down at temperatures considerably higher than 32°; the action being facilitated by the deposition of water or other substances. The effects of a reduction of temperature in causing the condensation of water in gas-pipes were next considered by the author, and it was remarked that, following the experience with naphthalene and water, the decomposition of iron carbonyl and the deposit of oxide of iron was probably most erratic and uncertain. The remedies against trouble from this source were the use of good purifying material, protecting the pipes from cold, desiccating the gas, and keeping down the carbonic oxide. It was also possible for gas to take up iron carbonyl by acting on the interior surface of the main-pipes, and to convey it into the consumers' fittings; these deposits having been experienced with lime-purified coal gas. The greater part of the volatile matter found in the deposit was considered to be free carbon, resulting from the decomposition of iron carbonyl. In concluding, the author referred to experiences recited at the recent meeting of the Pacific Coast Association, when it was stated that "granulated rust, the size of gunpowder, in many cases, had partly filled the pipes where they were in active service right along, but very seldom where the pipes were out of use."

In the course of discussion, Mr. Littlehales said that, contrary to the experience of the author, he found deposits accumulated quicker in untenanted than in occupied buildings. Mr. Ramsdell was surprised at the small amount of naphthalene in the deposit, and also that the corrosion of the pipes was so slight, looking at the fact that Long Branch was on the sea coast. Mr. C. H. Page remarked that ammonia left in the gas for want of proper scrubbing was a fruitful cause of rust deposits. Mr. Wheeler, in replying, said the building from which he obtained his deposits was a summer hotel, untenanted for eight months of the year. He had known rust to be found in composition or lead pipes. He also described in detail a process for extracting iron carbonyl from gas.

Mr. W. R. Beal, of New York, gave a description, with the aid of diagrams, of two 30 ft. by 24 ft. purifiers, 7 feet deep, lately erected by him at the works of the Central Union Gas Company of New York. They are mounted on columns, and include two four-way dry-faced plug-valves of improved construction. A special feature is that, while each box contains two layers of material, the gas is admitted at the middle—half ascending and half descending, to outlets at the top and bottom, which are fitted with damper slides to control the passage of the gas and ensure equal fouling of each layer. Two outlet-doors, with crossbars and screws, are fixed in the bottom of each box; and over these doors are moveable wrought-iron frames or cages, to facilitate the discharge of the spent material. The oxide is lifted by machinery. It was claimed that the arrangement afforded an important saving as compared with the ordinary system. The ground covered, and cost of buildings and of plant and connections, were all reduced; while the boxes being practically double, the speed of the gaseous current was reduced 50 per cent., giving better efficiency and less back-pressure. Purifiers on this system could be made, practically speaking, of any size, and as much as 10 or 12 feet deep.

The report of the Research Committee was then presented. Dealing first with the question of a standard for sizes of house piping, they remarked that the tables in general use appeared to be figured for a gas of ·420 sp. gr., and a loss of 0·1 inch pressure in 30 feet. They extended this table by adding the similar quantities for gas of ·550 and of ·680 sp. gr., and referred the question of the maximum loss of pressure on a given length of pipe to the meeting for discussion. The standard sizes for works' and street-main specials that had been proposed by the

Society of Gas Lighting, were adopted to some extent; but the Committee asked for another year before making a final report. They recommended the adoption of the United States standard gauge for sheet iron and steel plates. Several subjects were mentioned as interesting and suitable for papers at the next meeting of the Association; including the measurement of high temperatures, the self-enrichment of coal gas, the effect of depth of fuel on the practical efficiency of water-gas regenerators, the effect of regenerative settings and of dip-pipes on the production of ammonia, and the loss of illuminating power of 25 to 30 candle gas by admixture of air. The recommendations of the Committee were accepted; and after a long discussion, a motion for fixing the loss of pressure in house pipes at 0·1 inch on each 50 feet of pipe was adopted.

"Some Chemical Notes on Purification" were next read by Mr. H. A. Mather, of Brooklyn (N.Y.), who commenced by criticizing the various formulæ given in "King's Treatise" and by other authorities, for representing the reaction between sulphuretted hydrogen and hydrated oxide of iron. He objected to the use of any formula which included the expression $Fe_2O_3\,3H_2O$, on the ground that the hydrated sesquioxide loses part of its water of hydration unless kept under water. Freshly precipitated hydroxide from copperas had the composition $Fe_2O\,(OH)_4$; and bog ore and oxide prepared from borings was $Fe_2O\,(OH)_2$. Until a few years ago, but little attention was paid to the state of the hydration of the material; and sawdust was the only diluent used. Now, however, planer chips were considered to be better than sawdust. The purifying value of a bed of oxide depended on the percentage of hydrated oxide present, the state of division of the hydroxide, and the ability to maintain a proper condition of porosity. A German writer had lately claimed that the foul gas should not pass through the oxide at a more rapid rate than ½-inch per second; and Mr. Crisfield had given at their 1892 meeting a convenient rule for calculating the area of purifying surface required. Attention was next directed to Mr. Forstall's plan for applying dry heat as an aid to the purifiers, which was described at the last meeting. A catch-layer of porous material should always be used, if found to be necessary, to keep tarry matters out of the oxide; and this would be better in a separate vessel than in the usual position, where it received all the condensed moisture. The author preferred admitting a small percentage of air with the foul gas to the plan of revivifying *in situ*, which at best was only a labour-reducing device, and was liable to injure the oxide by overheating. He recommended the plan of spreading the material for revivification upon grids, rather than on a solid floor; thus admitting air beneath as well as above.

Mr. R. M. Searle, of Atlanta (Ga.), followed with a paper on "Gas Advertising;" using the word in a far broader sense than that generally accepted. A well-arranged office, and courteous and considerate treatment of the consumer, were good advertisements; and a trifling affront might be a very bad one. Every employee of the gas company was in a sense a standing advertisement; and each consumer, if properly dealt with, was a good advertiser. Sometimes advertising was said to be useless, when the real fault lay with the inefficient manner in which it was done. In some districts, it was an excellent advertisement to give away a number of brackets or other cheap fittings to the customers; and he particularly advocated attending to slight complaints free of charge, instead of referring a customer to a plumber. Burners that were damaged and out of order, or perhaps left out of use on account of some trifling defect, were not only a loss of business but a bad advertisement. Sending round a gas stove, and allowing practical trials on the consumers' premises, was a line that paid well. The company should also have an eye to gas-engines, and keep them in good order and running condition, if the consumer would not do it himself. An engine out of condition was a bad advertisement for gas. When installing apparatus, only the best should be put out; and no novelty should be employed that had not been first tested and proved at the gas office. He also found it desirable to take up the gas-fitting trade, and to carry out the work in a first-class style at a moderate charge. Much might be done in an indirect manner—for instance, by paying the publisher of the local paper a small fee for every advertisement in which gas was mentioned, such as "A house to let; gas laid on." He did not undertake to say how everyone should advertise, but merely contended that all should advertise in some way, and advertise well.

The speakers in the discussion agreed generally as to the desirability of bold and energetic advertising. Mr. Forstall remarked that taking up the fittings business was liable to arouse some jealousy on the part of the trade. A good office and show-room in the main street was the best advertisement. Mr. C. J. R. Humphreys, referring to one of the points made in the paper, said he had obtained good results by printing advertisements of gas-stoves on the paper bags used by grocers and fruiterers. Mr. C. H. Page was emphatic on the personal element. A good method often failed because it was not properly carred out. Mr. Littlehales was sending out a hand-cart carrying a supply of plain brackets, pendants, &c., accompanied by a good canvasser; and he sold £20 worth of goods per week. The advantage of cookery schools and demonstrations was also mentioned.

(To be continued.)

PROFESSOR LEWES ON ACETYLENE.

At the London Institution, last Thursday, a lecture on "Acetylene" was delivered by Professor VIVIAN B. LEWES, F.I.C., F.C.S., the Superintending Gas Examiner to the Corporation of London.

The lecturer first referred to the discovery by Sir Humphry Davy of the metal potassium, followed by the isolation of sodium, strontium, barium, and calcium from their compounds. He then alluded to the attempts made to produce sodium and potassium on a large scale, resulting in the discovery of acetylene by Mr. E. Davy, a relative of Sir Humphry, in 1836. The researches of Berthelot and Wohler twenty-six years later, leading to the synthetic production of acetylene, were mentioned; and then Professor Lewes passed over the gap of thirty years which brought him to 1892, when the present era of activity in the history of acetylene commenced—an activity which had, he said, resulted in bringing it from the condition of a chemical curiosity to that of a commercial product. Referring next to the formation of calcic carbide in the electric furnace, the work of Willson, the Canadian experimentalist, was reviewed, and the credit of this important discovery given to him. The claims to this distinction put forward by the French chemists having been considered, the lecturer said:

Leaving the question of priority, let us pass on to the more practical side of the history of the commercial formation of calcic carbide. The first experiments made by Willson were with a dynamo generating a current of 150 ampères at from 60 to 70 volts; the furnace consisting of a plate of carbon 12 inches square and 1 inch thick, which was made to constitute one terminal, and upon which a graphite crucible rested, while the other terminal was a carbon rod suspended above it. Having made his successful preliminary experiments, others upon a large scale were organized; and a plant was erected at Spray, in North Carolina, in which a dynamo worked by water power, and generating a current of 2000 ampères at 25 volts, was employed. Soon after the success of the Spray plant had been demonstrated, an electric furnace for making the carbide was put up in England, and has resulted in the large installation driven by water power which has now been for some time working at Foyers. In America also manufactories on a large scale have been started, using water power at Niagara. The latest works are those erected by Mr. Willson at St. Catherine, in Canada. On the Continent there are works at Froges, Neuhausen, and Bitterfeld; while M. Bullier has a factory at Notre Dame de Briançon, and several others are established in Europe.

No startling variation has at present been introduced in the form of the furnace used on the manufacturing scale; and the result of extended experience shows that for a consumption of one electrical horse power per hour, there can be produced from 0·3 lb. to a little over 0·5 lb. of carbide—the variation depending upon the working of the furnace and the way in which the mixture of lime and powdered carbon (generally coke) has been prepared. In making carbide, a good working mixture may be taken as 100 parts by weight of lime with 68 parts by weight of carbon; while for each pound of carbide made, about 1·8 lbs. of the mixture are used up.

It is found that as the ingot of calcic carbide is formed in the furnace, though the ingot itself consists of pure crystalline calcic carbide, it is nearly always surrounded by a crust in which the carbide contains a certain proportion of imperfectly converted constituents, which therefore give a lower yield of acetylene than the carbide itself; and in breaking up and sending out the carbide for commercial work, packed in air-tight drums, the poor crust is, as far as possible, picked out and rejected. It is perhaps misleading to state the amount made per electrical horse power, as a certain amount of loss is of necessity entailed during the breaking and packing. For instance, in practical working, I have found that while the furnace return was 0·504 lb. per kilowatt-hour, this amount has been brought down to 0·406 lb. when the material has been broken up, sorted, and packed in air-tight drums. It is practical differences of this character which in many cases upset the calculations put forward by inventors and promoters who desire to show that some theoretical paper process which they possess is far superior to those actually in use. It may be stated that 1·79 tons of the mixed lime and coke will yield 1 ton of carbide, and that one electrical horse power obtained from water power will cost about £4 in England.

Calcic carbide, which is a highly crystalline semi-metallic looking mass, decomposes water, forming slaked lime and acetylene gas. But it must be clearly borne in mind that in contact with moist air the carbide slowly undergoes decomposition, yielding small quantities of acetylene, and becomes itself coated with lime. It is therefore absolutely necessary, in order to keep it with safety, to have it packed in air and water tight drums. Under regulations recently issued by the Home Office, 5 lbs. of carbide are allowed to be kept at a time in hermetically sealed tins holding 1 lb. each; while with a licence, which is easily obtained, larger quantities may be stored in a separate building at least 10 feet from the house.

In the manufacture of calcic carbide, the purity of the materials used cannot be too highly insisted upon. There is no difficulty in obtaining fairly pure lime and good metallurgical

coke, in which the phosphorus and sulphur present in the ash amount to only the smallest trace, and from which carbide of great purity can be made. If, however, the materials employed contained phosphorus compounds, silica, and sulphur compounds, the carbide and the acetylene generated from it will be correspondingly impure; and there is no doubt that if the acetylene gas contain any considerable proportion of phosphuretted hydrogen, siliciuretted hydrogen, and sulphuretted hydrogen, which is the case when impure carbide is employed, there ensues a certain amount of danger of spontaneous ignition, while the products of combustion formed from these bodies are not only deleterious to health, but destructive to furniture, draperies, &c., in a room. I have made an exhaustive series of experiments upon the influence which these impurities have on the safety of the carbide and the acetylene formed from it, and have come to the conclusion that, so long as manufacturers of the carbide are prevented from using cheap and impure material, no danger from this source need be anticipated; and though I have come across specimens of carbide that contained enough impurity to render them dangerous, that carbide has always been of foreign manufacture.

During the past two years and a half, the Patent Office has been inundated with applications for the protection of various forms of apparatus in which the water and the carbide are brought together to generate the acetylene. In my lecture at the Society of Arts in 1895,* in which I first introduced calcic carbide and acetylene to the English public, I pointed out that there were three methods by which this could be done—first, by allowing water to drip upon the carbide, in which case until near the end of the reaction the carbide was in excess; secondly, by altering the level of the water so as to allow it to come in contact with the carbide held in a chamber or cage, in which case a considerable volume of water might be in contact with the carbide acted upon; and, thirdly, by dropping the carbide into a large volume of water, in which case the water was always in excess. It has been one of those three principles which has been adopted in all the generators at present patented; the only difference being variations in details.

By the first method, you have intense heat developed, which tends to polymerize some of the acetylene into liquid products, which also, by decomposing all the impurities present in the carbide, render the gas extremely impure; and generators, if made on this principle, must have elaborate arrangements for keeping down the heat evolved by the action of the water on the carbide. The second form has some of the disadvantages of the first, though not to so great an extent. The third form, in which the carbide drops into a large volume of water, is undoubtedly the best, as not only is there no undue rise of temperature, but the gas evolved has to bubble through a certain amount of water, which condenses and washes from it the impurities. The great point besides these which should be taken into consideration when selecting a generator, is that under no possible conditions should the pressure rise above a few inches of water, while the pressure in the pipes leading from the apparatus should never be above 2 or 3 inches. Given a proper form of generator, pure carbide, and a low pressure in the service-pipes, acetylene is as safe for domestic lighting as coal gas.

The decomposition of water by calcic carbide is due to the enormous affinity which calcium possesses for the oxygen of the water. It is perfectly well known that such metals as sodium and potassium, when placed upon water, decompose it; and in the case of potassium, the heat evolved is so great that the escaping hydrogen is set on fire. If, however, instead of using the pure metal, the carbide of the metal is taken, at the moment that the combination of the metal with the oxygen of the water occurs, the nascent hydrogen and the liberated carbon combine to form acetylene gas. A pound of carbide gives theoretically 5·8 cubic feet of acetylene; but in practice the carbide cannot be guaranteed to evolve an average of more than 5 cubic feet, as, though this is often exceeded, no matter how carefully the carbide is picked over, portions of crust are liable to find their way into the material and reduce the quantity of gas evolved.

Acetylene is one of those compounds during the formation of which heat has been absorbed instead of evolved, as is usually the case. Compounds of this character are known scientifically as endothermic bodies; and many of them, owing to the great development of heat during their decomposition, have extremely explosive properties. Acetylene itself can be caused to decompose with great rapidity into its constituents carbon and hydrogen by firing in contact with it a detonator containing mercuric fulminate. At ordinary pressures, and indeed up to nearly 2 atmospheres, this detonation of the gas does not spread more than a few inches from the point where the explosion occurs; but if the gas be taken at higher pressures than these, a detonation started in the gas spreads throughout the whole bulk, and may be commenced by heat as well as by explosion. The result is that acetylene at high pressures becomes an active source of danger. The Home Office is very properly preparing regulations in which, as I understand, the pressure allowed will be somewhere between 10 and 100 inches of water, which will not interfere with house lighting; while liquefied acetylene, which at one time appeared to have a considerable future before it, will be placed, together with high-pressure acetylene gas, under the Explosives Act. There is no doubt that this action is fully justified, in view of the serious accidents which have occurred in America, Paris, and Berlin, where liquefied acetylene has been extensively experimented with. These regulations will, to a certain extent, hamper the adoption of pure acetylene in some directions; but they will undoubtedly conduce to its ultimate success, as nothing has done more to hinder the introduction of this beautiful illuminant than the hap-hazard experiments made with it by unskilled persons. The only wonder is that there have not been a great many more accidents during the past two and a half years. Though with an accredited illuminant like petroleum one can afford to kill a man a day without discrediting oil lighting, with a newly-introduced material like acetylene one accident has a serious effect in checking its onward progress.

One of the great difficulties which up to the present time has been found in the utilization of pure acetylene is the trouble of finding a burner which will consume it without the nuisance of smoking. Many have been devised for this purpose; but not one of them can be relied upon to consume the gas for more than a few hundred hours without to a considerable extent getting clogged and beginning to smoke. As a smoking acetylene burner means a soot-storm of considerable magnitude, many people who would have taken up acetylene as an illuminant have been content to wait the course of events. Now I think the smoke difficulty has been thoroughly solved by a form of burner made by Mr. Naphey in New York and by Mr. Walmsley in Chicago, in which two small jets of acetylene are brought out in such a way that as they leave the burner they are surrounded by a tube of air, which prevents the acetylene coming in contact with the burner-tube. These two jets then meeting, splay one another out into a flat flame; and as far as experience has at present gone, these burners show no tendency to choke or smoke.

The regulations of the Home Office with regard to acetylene gas under pressure will hamper the introduction of pure acetylene for railway carriage and tramcar lighting—a direction in which it appeared to have a very extended future before it. But I have always been of the opinion that, for such purposes as these, diluted acetylene would be more valuable than acetylene by itself; and some experiments which I made soon showed that as acetylene gas is diluted down, the explosive power which it possesses *per se* rapidly begins to disappear, so that by the time a mixture of 30 per cent. of acetylene with the diluting gas is made under the p essure which exists in railway carriage cylinders, all danger of explosion has gone. Experiments which have since been carried out by Messrs. Pintsch on a large scale confirm these facts, and show that when their oil gas, which is at present largely used in railway carriages for illumination, is mixed with from 20 to 30 per cent. of acetylene, no danger of explosion exists.

The great trouble which has presented itself in diluting acetylene with any cheap diluent is that the illuminating power of the acetylene is reduced to an enormous extent. It has been found that hydrogen, carbon monoxide, and water gas are useless for this purpose, as 10 per cent. of acetylene mixed with either of them produces a practically non-luminous flame; while if the acetylene is used in sufficient quantity to give a satisfactory light, the percentage of acetylene needed is too high to be commercially possible. It has been proposed to use air, carbon dioxide, and even nitrogen, in order to dilute acetylene down to the limit at which it can be consumed in large burners without fear of smoking. When air is used, a factor of real danger is introduced; while carbon dioxide is worse than water gas, and nitrogen nearly as bad.

Feeling strongly that the only way to secure good illuminating effect, freedom from smoking, and safety when compressed for railway and tram lighting, was to find a cheap diluent which should maintain the enrichment value of the acetylene at something near the value of the gas when burnt alone, I instituted a long and exhaustive series of experiments, and not only found the reason for the failure of water gas, hydrogen, and carbon monoxide, but also discovered that methane was the only gas which would do the work required, and further that the presence of 30 per cent. of methane when mixed with hydrogen, carbon monoxide, or water gas, converted it into an excellent diluent, with which 10 per cent. of acetylene gave a 20-candle power gas capable of being burnt in ordinary gas-fittings, distributed through the mains and pipes, and indeed behaving in every way like coal gas. Further researches also showed that dilution reduced the possibility of exploding the gas *per se* well below the limit of safety, as acetylene which, under a pressure of 2 atmospheres, could be detonated at a dull red heat, when diluted had the temperature necessary to bring about explosion raised to 100°C. for each 10 per cent. of diluting gas mixed with it; so that with a mixture containing enough acetylene to make a brilliant illuminant for compression in cylinders for carriage and tram lighting, a temperature which would melt the metal cylinder would be required to cause explosion.

Even at the present time there are many small towns where, owing to position and other causes, coal gas costs from 5s. to 6s. per 1000 cubic feet; while hundreds of villages exist where the consumption would not admit of the heavy initial expense of coal-gas plant. The apparatus needed for making the diluting gas, and enriching it with acetylene, is comparatively cheap; and 10 per cent. of acetylene will give a 20 to 22 candle gas. A carbide company starting works for villages and small towns

* See "JOURNAL," Vol. LXV., p. 168.

could well afford to debit themselves with carbide at £10 a ton, which would provide 12,000 cubic feet of acetylene, and the lime needed for purification. The diluting gas can be made at 8d. per 1000 cubic feet; but for argument it may be called 1s. Consequently, 12,000 cubic feet of acetylene and 108,000 cubic feet of the diluent would cost £15 8s, or 2s. 7d. per 1000 cubic feet. Adding 11d. for charges on capital, distribution, profit, &c., the 20-candle gas could be sold at 3s. 6d. per 1000 cubic feet; and though there is a big field for the pure acetylene in country-house lighting, I am inclined to think it will be the diluted gas which will offer the largest scope for speculative industry.

THE WHITE AND MIDDLETON GAS-ENGINE.

A gas-engine which has made its mark as an economical motor in America is about to be introduced in this country by a Company which has been formed to acquire the patent rights for the United Kingdom, France, Belgium, and Germany. The engine is the joint invention of Messrs. C. White and A. R. Middleton, of Baltimore; and its great point is the simplicity of its construction, which simplicity, according to the testimonials from "the other side," is in no way detrimental to a high efficiency.

The patent specification was noticed in the "JOURNAL" early last year; but it will not be out of place to once more direct attention to the salient features of the construction of the engine. It is of the prevailing two-cycle type; and the claims of its constructor are as follows: The gas and air are drawn through a valve into the cylinder by the out-stroke of the piston, compressed by the following in-stroke, and ignited in the centre by an incandescent closed tube; the charge being exploded, and the impulse received, on the out-stroke. The main exhaust port is uncovered by the piston at its extreme out-stroke, and nine-tenths of the products of combustion are discharged. This first discharge includes all the fire and heat. The balance (one-tenth) of the burnt charge remaining in the cylinder at atmospheric pressure, is expelled through the supplemental exhaust valve by the following in-stroke, which completes one working cycle. This second, or supplemental, discharge contains no fire or heat to effect the valve; but merely discharges the small portion of foul gases left in the cylinder. A ball-governor operated by a two-to-one gearing connected with the crank shaft thereby actuates the supplemental exhaust and gas supply valve, but at such times only when an explosive mixture is required for the amount of work the engine has to do. When the engine runs at its full capacity, these valves open at every second revolution; when less work is required they do not open so often. The construction of the governor is novel, neat, and effective, giving very close regulation. The incandescent closed tube igniter is said to work with positive and prompt ignition, without the loss of a single charge, even under a speed of 400 revolutions per minute.

The claims for superiority in the working of the engine in comparison with those already well known in this country will no doubt give rise to some controversy; but the opportunity for testing its capabilities are already at hand. One of the engines has been fixed, and is in operation, at 29, Queen Victoria Street. It is of 12-horse power actual and 13 6 indicated; and in order to prove the consumption of gas, one of Messrs. Alexander Wright and Co.'s test-meters has been connected to the supply-pipe. A cursory inspection of the engine, together with the drawings, is sufficient to show that the working parts are comparatively few in number, and that the aim of the inventors has been to avoid all complication—in fact, in respect to the valves alone, there are only three in the whole construction. This reduction of the working parts to a minimum must, of course, have an important bearing on the question of the cost of production and repair. Then it is claimed that, owing to the improved method of exhausting the burnt gases, this is the only gas-engine that will stand up to its full brake load month by month and year by year. On this point, a gentleman interested in the engine remarked to a representative of the "JOURNAL" that "anyone accustomed to gas-engines knows well that this is not the case with any other engine on the market at the present time, as, after they have been running for a very short period, their exhaust-valves, through having the burnt gases passed through them, have to be removed and ground up, to enable them to sit on their seats. If this grinding and cleaning were not done, there would be a very serious loss of power on account of the leakage through the valves not fitting properly on their seats, and also, in consequence, loss of expansive force."

Claims are also made on several points which will particularly commend themselves to the users of gas-engines. It is stated that there is a great economy in the gas consumed by the engine when running either with or without a load; that no skilled mechanic is required to run the engine or to take it to pieces and put it together again; and that it starts much easier than any other engine. The claim as to the economy in gas is confirmed by the reports of the Judges at the National Industrial Exhibitions held, in connection with the American Institute, in 1890 and 1891, in both of which years Messrs. White and Middleton received the Medal of Superiority. The Judges reported in 1890 that their tests showed "a hitherto unattained economy in gas-engines;" and in the following year, they said the engine "maintained its record for unusually large economy in gas as developed last year, and the more noticeably so when running without a load." The floor space needed by the engine on view is only 7 ft. by 2 ft. 9 in., over all; and this is an important consideration, where the available area is limited.

The manufacture of the engine will be carried on at Colchester, where the Company have acquired extensive premises for the purpose. For the first few months, the Company will have the benefit of the supervision of one of the inventors, and of the services of a few experienced hands.

REGISTER OF PATENTS.

APPLICATIONS FOR LETTERS PATENT.

23,887A.—ATTERBURY, B. J., "Production of acetylene gas." Nov. 20.
26,566.—GORE, J., "Burner for acetylene and like gases." Nov. 15.
26,567.—BARTLETT, F. G., "Incandescent gas-burners." Nov. 15.
26,581.—GENTLE, D. M'G., "Gas or oil lamp." Nov. 15.
26,584-5.—BENNETT, J. F., and MOORWOOD, H. S. & T. P., "Gas and oil engines." Nov. 15.
26,591.—WARTENWEILER, A., "Acetylene-gas lantern." Nov. 15.
26,594.—HELVIG, E., "Producing acetylene gas." Nov. 15.
26,612.—TWEEDALE, C. L., "Holders for globes and chimneys." Nov. 15.
26,633.—CHALMERS, G. W., "Incandescent gas-burners." Nov. 15.
26,645.—PRICE, J., "Pipe joints." Nov. 15.
26,648-9.—JONES, W. J. H., "Prepayment gas-meters." Nov. 15.
26,676.—SCHMID, F., "Acetylene lamps." Nov. 15.
26,745.—BROGDEN, G., "Incandescent mantle supports." Nov. 16.
26,776.—KREMER, J., "Acetylene gas generators." Nov. 16.
26,791.—CUTLER, S., "Automatic regulator for gas exhausters." Nov. 16.
26,799.—DOWSING, H. J., "Utilizing part of the heat of gas and other heating stoves for the purpose of generating electric currents." Nov. 16.
26,834.—FLETCHER, T., and FLETCHER, RUSSELL, AND CO., Ltd., "Atmospheric gas-burners." Nov. 17.
26,839.—JAMESON, J., "Gas-fires." Nov. 17.
26,842.—BOND, E. S., "Using acetylene gas with ordinary lamp apparatus." Nov. 17.
26,843.—BOND, E. S., "Storing and using calcium carbide for acetylene gas generating apparatus." Nov. 17.
26,863.—ANDERSON, W., "Incandescent gas-burners." Nov. 17.
26,880-1.—CREES, G. W. B., DURBAN, W. L., and GORE, J., "Production of calcium carbide." Nov. 17.
26,893.—DOBRASHIAN, G. S., "Gas motor engine." Nov. 17.
26,900.—SOUTHALL, J., "Gas or oil motor engines." Nov. 17.
26,970—ORME, A., and JONES, F. J., "Gas-generators." Nov. 18.
26,971.—ORME, A., and JONES, F. J., "Gas-fired muffles" Nov. 18.
27,016.—FRASER, A. C., "Burning acetylene and other rich gases." Nov. 18.
27,026.—M'PHAIL, H., "Softening and purifying water." Nov. 18.
27,029.—MAITI, R. von, "Acetylene lamps." Nov. 18.
27,065.—BENJAMIN, J., "Generating acetylene gas." Nov. 19.
27,082.—RETTICH, V. A., "Hanging gas-lamps or pendants, for the purpose of neutralizing vibration." Nov. 19.
27,112.—CROUAN, H., "Regulator for gas and petroleum motors." Nov. 19.
27,147.—THOMPSON, W. P., "Automatic gas lighters." A communication from T. Adams, jr. Nov. 19.
27,214.—THORP, T., "Self-closing valve for use in connection with gas-burners." Nov. 20.
27,240.—FORCHER, A., "Acetylene gas generator." Nov. 20.
27,257.—MOND, L., "Converting the energy of coal into motive power by the combined working of gas-engines and gas generators." Nov. 20.
27,288.—REIBEL, J., "Generating acetylene gas." Nov. 20.
27,300.—REIBEL, J., "Acetylene gas generating apparatus." Nov. 20.
27,301.—RAVEL, J. P., "Gas and like engines." Nov. 20.

Cheltenham Water Supply.—The Cheltenham Town Council, who obtain most of their water from the River Severn, have decided to apply to the Local Government Board for power to borrow £30,000 for the extension of their water-works.

Opening of Gas-Works at Colwall.—The movement initiated about twelve months ago for supplying the pretty little Herefordshire village of Colwall with gas, which resulted in the formation of a Company for the purpose, with Mr. G. H. T. Foster as Secretary and Mr. J. H. Lyon as Engineer, culminated in the opening, on Monday last week, of the gas-works which have been constructed for the purpose by Messrs. Robert Dempster and Sons, of Elland. They comprise a retort-house 30 feet square and 18 feet high to the eaves, and at present containing two arches, each with five retorts. It forms a coal-store, and is connected by a tram-line with the railway. The condensers are of cast iron, of the vertical type; and the scrubber is of wrought-iron plate, 20 feet high and 3 feet in diameter, and is furnished with a water cistern and a distributor. There are two purifiers, 6 feet square and 3 feet deep, arranged for working either singly or together. The station meter is one of Parkinson's. The gasholder is 35 feet in diameter and 14 ft. 3 in. deep; and it has a storage capacity of about 13,500 cubic feet. None of the pipes on the works are less than 6 inches in diameter. There are upwards of three miles of mains laid, varying from 6 to 3 inches in diameter. The opening ceremony was performed at the works by Mrs. Black, the wife of the Chairman (Rev. C. Black), in the presence of a numerous company. Subsequently a move was made to the retort-house, where the Manager (Mr. W. Mason) drew a retort, and Mrs. Ballard, the wife of the Vice-Chairman (Mr. F. Ballard), lighted a jet over the doorway. Lamps at various places in the village were afterwards lighted by ladies. The occasion was a noteable one—all the residents being on the alert. A public dinner took place at the Oddfellows' Hall; a free tea was served at the Temperance Hotel; and there was a display of fireworks.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Gaseous Firing.

Sir,—In 20-feet oval retorts, 21 inches by 15 inches, heated as described in my paper, an average charge of 6½ cwt. of Durham coal is easily and thoroughly carbonized. The limit is only fixed by the space required to get the rake-head over the top of the spent charge. As an experiment, charges of 7 cwt. have been readily burnt off; but the retorts were then completely filled and were only drawn with great difficulty.

There is no trouble in heating the bottom retort to the same degree, and with the same regularity, as the top. Inspection of the drawing will show that both are treated in an exactly similar manner as regards the arrangement and mass of the brickwork surrounding them. The only precaution necessary is to keep the gas-ports sufficiently low in the setting. As an instance of the perfect control attainable over the heating, I may mention that in the setting of "ten's" figured, the four upper retorts have been held in reserve for several weeks throughout one retort-house, while the six lower ones were charged and drawn in the usual way, and this without the slightest overheating or injury to the idle retorts or the brickwork.

I am quite familiar with the dodge of blocking up the gas and air ports with loose tiles and bricks in those parts of the setting which get overheated; and Mr. Fletcher is quite correct in affirming the possibility of thus regulating the heats with the jet-pierced producer arrangement. But the necessity for doing this is a strong argument that the system is defective.

I assure Mr. Fletcher that the retorts are quite evenly heated from end to end; and if he will study the drawings which you have re-produced, I am sure he will soon see why this is so. If he does not, I shall be pleased to give him at Vauxhall ocular demonstration and proof.

Vauxhall, November 27, 1897. C. C. Carpenter.

Sir,—I am very surprised to read in Mr. F. D. Marshall's communication on "Retort Setting and Heating," in the last number of the "Journal," an alleged opinion expressed by me at the recent Southern District meeting, that "there was no economy in generator settings"—an opinion which I do not hold, as the context of my remarks as published will show. I did certainly point out that, judged by the amount of "coke for sale" shown on the balance-sheets of those companies using gaseous fuel, this item did not show a very marked superiority over those using ordinary furnaces; and, of course, I was referring to particular cases where a similar description of coal is used. To illustrate this, I will give some figures, taken from accounts made up to a recent date, which are fairly comparative.

Coke and Breeze for Sale per Ton of Coal Carbonized.

Works Using Gaseous Fuel.		Works having Ordinary Furnaces.	
A . . .	11·9 cwt.	A . . .	10·7 cwt.
B . . .	11·3 ,,	B . . .	11·3 ,,
C . . .	9·8 ,,		
Average .	11·0 cwt.	Average .	11·0 cwt.

I think it is far preferable to base the comparison on the quantity of coke for sale, than on so many pounds of fuel used per 100 lbs. of coal carbonized; but I should take the 28 to 40 lbs. quoted by Mr. Marshall as used in ordinary furnaces as extreme figures, and not applicable to medium-sized works. At these works, it has for some years worked out at about 12½ lbs. on a similar comparison, using ordinary furnaces.

The object of my remarks at the meeting was to point out that, where gaseous fuel was not available, great improvements were possible with the ordinary mode of firing and in the setting of retorts; but I am none the less, as I said, a firm believer in the general advantages of gaseous fuel, when it can be applied.

Hastings, Nov. 25, 1897. Charles E. Botley.

Sir,—In your issue of the 23rd inst. a letter from Mr. P. H. Fletcher, of Evesham, appears which bears upon Mr. Carpenter's most interesting paper at the recent meeting of the Southern District Association. The former states, as his experience, that in a setting of sixes, three high, the heat in the two bottom retorts is not as great as in the top retorts. It may be a consolation to him to know that others have had the same trouble he complains of, and in larger works than his. But let him take heart, and believe that an opposite experience is to be found. I have set retorts in which the heats in a bench of sixes were such that it would be difficult to tell which was the hottest retort out of the three open on one side. The retorts were 22 in. by 14 in., ⌂ shaped, and 9 feet long, in a setting 7 ft. 1 in. wide; and the production in 24 hours was 8000 cubic feet per mouthpiece, without blocked ascension-pipes. The openings for the producer gas and the secondary air were several times as large as those mentioned in Mr. Carpenter's paper; and no trouble was found from choking, on account of their size, nor was it necessary to use in any way shields on the retorts. The secondary air was raised in temperature, in two flues on each side of the setting, by the heat of the brickwork; for it was not feasible to put in regenerative settings. The furnace was deep, and of much greater area than ⅔ foot per mouthpiece; and little annoyance was found from clinker—what there was came down in a loose friable state, owing to the use of steam with the primary air. Failing this steam for only an hour or two, the furnace had to be let down low, and the clinker punched off—entailing much labour and some destruction of brickwork.

As to the employment of a certain brand of brick, what suits one engineer may be condemned by another; nor is the most expensive article always the cheapest in the long run. Only silica bricks are permissible by some in the combustion chamber, while others find Scotch bricks answer; and in retorts Stourbridge have been highly recommended to me by a friend who found them suit his purpose. Many pin their faith to bricks from other districts; and I have seen bricks equal to some of the best here turned out in New Zealand.

Then, again, retort blocks are condemned as being expensive; and they are shunned, and cut bricks put in, with perhaps too thick a joint of clay. Then the setting is found to settle through this cause, or from the use of unshrunk bricks. I have found good results to ensue from the judicious use of bricks that have been previously burnt in the setting. Fantastic blocks are, no doubt, costly in making, packing, and transit; but simple blocks, made just large enough to cover the curved parts of the retort, and designed of such a contour that common stock sizes of bricks can be used against them, will commend themselves to those who standardize their settings.

In some designs of settings, how often it is noted that an opening will be made without it having any relation to how bricks will suit the work; whereas cutting might be avoided if the dimensions had some kinship to a half or a whole brick. In works where the whole retort-stack is put up by an enterprising contractor for a lump sum, such details are lost sight of, or at least ignored; but to those who have to superintend men under them, this cutting of bricks gives place to means devised to circumvent waste of time.

On the question of cross-walls, it is a matter of opinion as to whether they should be 9, 6, or 4½ inches wide; and the spaces vary from 10 to 7 inches. Some would perhaps prefer 6 inches; but, having a large stock of bricks 9 inches long and 4½ inches wide, they hesitate about increasing the stock. So that here, again, it is sometimes a determination to stick to what is in stock, and has been found to answer, rather than try something new.

Nov. 26, 1897. T. S. Cleminshaw, Assoc.M.Inst.C.E.

Sunday Labour in Gas-Works.

Sir,—The question of the reduction of Sunday labour in gas-works must commend itself to all pecuniarily interested therein—whether directors, engineers, or shareholders. I venture to plead, therefore, on behalf of a man who may be considered as the pioneer of this movement. Dr. Gritton, as far back as 1869, took steps to ameliorate the condition of things. He availed himself of the assistance of two or three practical men, who grappled with the manufacturing difficulties of the question; while he himself did all the secretarial part of the work—such as sending out circulars of inquiry as to what was done in the matter to all the gas managers in Great Britain and Ireland, tabulating their replies, and on the last occasion forming the whole into a pamphlet, with statistics showing the progress made from 1869 to 1897.

In London the system is carried out in its entirety, the works in all cases being idle for twelve hours on Sunday; and the men themselves, owing to the change from night work to day work being made at the same time, get 24 hours off. In the country, this is carried out in many instances entirely, and others partially. I feel certain that some at least of the shareholders will acknowledge the hand of Providence in the uninterrupted prosperity of gas companies, which, to my knowledge, has continued—in London at any rate—for thirty years; and that they will regard this as largely due to the efforts which have been made to abolish all unnecessary Sunday labour. Those who do not think this, may still appreciate, from a temporal point of view, the labours of a man who has been the means of relieving an immense number of his fellows from the curse of Sunday toil. It is hoped, therefore, that all who derive pecuniary benefit from gas will give towards a fund to be raised in recognition of Dr. Gritton's services in this matter. I would especially appeal to shareholders who held their shares before the sliding-scale was introduced, as in consequence of this, and also the lower price of gas stocks at the time, they receive a larger dividend than the present investor does. Subscriptions will be received by Mr. A. Dougall, Gas-Works, Tunbridge Wells.

Nov. 27, 1897. A Gas Proprietor.

The "Manjak" of Barbados.

Sir,—My attention has been called to your issue of Oct. 12 last, in which you, quoting from the report of the Acting Governor of Barbados, describe manjak as having a fuel value of £2 a ton. When the Governor asked me eighteen months ago for a few notes upon the new industry, I described the mineral in the terms you have quoted; but what was a true description at that time is misleading now. Then the value of the mineral was unknown; and its only uses appearing to be for fuel, it was sold at £2 and in some cases at £1 a ton. Since then it has been shown that the manjak from my mines is equal to the best Gilsonite, which is quoted in New York at $60 (£12 5s.); and the demand for it from America is greater than the supply.

It is used for making varnish, insulating electric wires and wooden pipes, making india-rubber, waterproof paper, car roofing, paving, red and green paint, and phenacetin and anti-pyrin; and it is being applied to several new purposes every day. As a natural result of this, the fuel industry has been stopped; but in its place a far more valuable one has been introduced, which in certain parts of the island is already shouldering out the making of sugar. Out of a population of 180,000 persons in this island, probably 2000 are now supported by manjak; and during the last two years probably 4000 tons have been raised.

Manjak is a hydrocarbon; the best quality containing 97½ per cent. of carbon. It occurs in veins in the blue clay—a stratum which underlies the infusorial earth. The veins are ¼ inch wide at the outcrop, and gradually increase in thickness as they descend. No vein has been explored below 200 feet; yet at that depth one gives 6 feet breadth, though higher up it is 30 feet wide. Their length is unknown; but it is believed that they begin beyond the sea on the south coast, pass under the coral in the centre of the island, and end in the sea beyond the north coast. The strike is N.N.E. and the general dip perhaps 30°. The deviation from the perpendicular is about 3°. There is a good specimen of manjak at the Imperial Institute.

Bridgetown, Barbados, Oct. 30, 1897. W. Merivale, M.Inst.C.E.

Incandescent Gas Lighting in Islington.—The result of a twelve-month's trial of incandescent gas lighting in Islington is, according to a report by the Surveyor to the Vestry, £3 12s. 6d. per lamp; but as the light afforded is twice as much as that given by ordinary burners, the net cost is £1 8s. 7d., as compared with £2 3s. 6d. A further trial of the lights is to be made.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1898) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

Aberystwyth Gas.—Application is to be made by the Aberystwyth Gas Company for authority to purchase, by compulsion or agreement, the freehold or reversion of certain lands now held on lease by them, and at present occupied by their works, and to erect thereon new works for the manufacture and storage of gas and residual products. Authority will be sought to make and deal in stoves and other appliances. The provisions of the Company's existing Act of 1873 are to be altered as far as they relate to the charge to be made for gas and the dividends to be paid. Other matters to be dealt with in the Bill to be promoted refer to the pressure, quality, and testing of gas. Additional share and loan capital will be asked for.

Bacup Corporation Water.—The Corporation of Bacup will apply for power to carry out certain water-works, comprising two storage reservoirs, three catchwater drains, and three aqueducts. Certain streams and waters are to be impounded; but provision will be made for furnishing compensation water. Permission will be asked to borrow more money for carrying out all or any of the intended works, and generally for the water undertaking of the Corporation.

Bakewell Gas.—The Urban District Council of Bakewell intend to apply for power to acquire the undertaking of the Bakewell Gas Company and the reversion of the Duke of Richmond in their works, which are to be vested in the Council. Power will be sought to maintain the works, to construct new ones, acquire lands, manufacture gas and residuals, and generally carry on the business of the Company, which will be dissolved. The limits of supply will be the district of the Council and the townships of Ashford and Great Longstone and the rural district of Bakewell. The present borrowing powers of the Council are to be enlarged.

Blackpool Improvement.—In a General Purposes Bill of which the Corporation of Blackpool have given notice, power will be sought to extend the limits within which they may supply gas, so as to include the township or parish of Bispham-with-Norbreck; also to supply gas and electric energy in bulk within or beyond their limits. They will further seek authority for the transfer to them of the powers of other bodies for producing and supplying electric energy. Additional borrowing powers will be included in the application.

Brompton, Chatham, Gillingham, and Rochester Water.—The Brompton, Chatham, Gillingham, and Rochester Water Company intend to apply for power to construct additional works, comprising a pumping-station near their well at Luton, and an aqueduct therefrom to a service reservoir to be constructed at Woolman's Wood, on the Maidstone Road. The limits of supply are to be extended so as to include the parish of St. Margaret Extra, or some part thereof. Provision is to be made for the prevention of waste and the protection of the water. Additional capital will be required.

Bury Corporation.—Application will be made by the Bury Corporation for authority to construct a reservoir on a stream known as the Cross Bank Brook, near the junction of the Bury Old Road with the road leading from Shuttleworth to Cheesden, and to make, maintain, and renew lines of pipes for distributing the water to any premises within the district of the Corporation. It is proposed to purchase compulsorily certain lands required to protect the sources of supply from pollution. The rates and charges for water are to be increased. The loans for gas-works purposes are to be consolidated, and the period for their repayment extended. Additional borrowing powers will be applied for.

Carlisle Corporation Water—The Corporation of Carlisle intend to apply for power to carry out the new scheme of water supply from the River Gelt and its tributaries which has already been alluded to in the "JOURNAL." In the parliamentary notice the works are described under eighteen heads. They comprise an intake-tank in the parish of Geltsdale, a storage reservoir in the parish of Castle Carrock, a service reservoir in the parish of Wetheral, and various aqueducts, pipe-lines, and auxiliary works. Provision will be made for the protection of landowners, millowners, and others, and for preserving the gathering-grounds and sources of supply from pollution. It is proposed to discontinue the present works. Power will be sought to supply water to other authorities, bodies, and persons, and to enter into agreements with landowners, local bodies, and others. The limits of supply are to be defined. More money will be applied for.

Carmarthen Improvement.—The Corporation of Carmarthen purpose constructing water-works, comprising a storage reservoir, a conduit, and a storm-water bye-wash, all in the parish of Newchurch, together with various auxiliary works; and they will apply for the necessary power to carry out the scheme, supply water to ordinary consumers and in bulk, and levy rates and charges therefor. Authority will be sought to interfere with property and divert streams.

Clacton-on-Sea Gas and Water.—The Clacton-on-Sea Gas and Water Company, Limited, desire to be dissolved and re-incorporated, with power to enlarge their works and extend their limits. Provisions will be made in regard to the supply of gas in bulk, the sale or letting of meters, stoves, and apparatus, and the price and quality of gas. The capital is to be defined and increased.

Coventry Corporation Gas.—The Corporation of Coventry wish for authority to purchase additional lands at Foleshill for the construction of gas-works, and to extend their limits of supply so as to include the parish of Exhall. They also desire an enlargement of their powers to allow of the establishment of reserve and renewal funds. Permission will be sought to borrow money for the above-named purposes.

Cranbrook Water Supply.—The Cranbrook District Water Company intend to apply for power to construct additional works, extend their area of supply so as to include Tenterden and other places in Kent, and Northiam and Beckley in Sussex, and increase their rents, rates, and charges. It is proposed to repeal certain powers conferred by the South Kent Water Act, 1889. Additional share and loan capital will be applied for.

Crawley and District Water.—Application will be made for the incorporation of a Company to construct works and supply water in the parishes of Crawley, Ifield, and Three Bridges, together with a portion of the parish of Worth extending into Crawley. The works will consist of a well and pumping-station, two service reservoirs, a water-tower, and four conduits or pipe-lines. The powers usually granted to water companies will be sought.

Cromer Gas.—The Cromer Gas and Coke Company, Limited, seek to be dissolved and re-incorporated with additional powers. The present works are to be maintained, and additions made thereto. Authority will be sought to raise further capital.

Drogheda Gas.—The Drogheda Gas Company seek to be dissolved and re-incorporated, with power to supply gas in the borough of Drogheda. The existing works are to be maintained and extended; and additional capital will be required. The usual privileges conferred in connection with the supply of gas will be sought, as well as authority to apply for an Order or Licence under the Electric Lighting Acts. Provision will be made for the supply of meters, fittings, &c., for the prevention of waste of gas, and for its sale in bulk.

East Ham Improvement.—In a General Bill to be promoted by the Corporation of East Ham, power will be sought to make provision for a constant supply of water throughout the district, and to repeal, wholly or in part, all or some of the provisions of the 30 & 31 Vict., cap. 148, and any other Act relating to the East London Water Company. The Corporation will ask for authority to raise more money.

Edinburgh and Leith Corporations Gas.—As our readers are aware, application is to be made by the Gas Commissioners of the Edinburgh and Leith Corporations for power to construct new works for the manufacture and storage of gas and the treatment of residual products on a site to be acquired for the purpose; the present works to be either maintained or discontinued and sold. The terms of the notice given by the Commissioners were set forth in our "Notes from Scotland" last week.

Edinburgh and District Water.—The Edinburgh and District Water Trustees have given notice of their intention to promote a Bill to obtain power, among other things, to raise the waste weir of the Gladhouse reservoir to the extent of a foot, which will have the effect of increasing its storage capacity by 100 million gallons. Authority will also be sought to put down a culvert and line of pipes from the Gillycubdean well, which is about two miles nearer Edinburgh than Gladhouse, and to legalize the loop-line recently laid by the Trustees along the public road through the Straiton Estate. Further powers will be asked to make several deviations in the authorized mains, to improve the line of the pipe-track; and to include within the limits of supply the parishes of Lasswade, Cockpen, and Carrington. Additional privileges in regard to opening public roads and highways, and laying down, enlarging, or duplicating the existing mains, will be applied for, as well as authority to raise additional capital.

Enfield Gas.—Application will be made by the Enfield Gas Company for a re-definition and extension of their limits of supply so as to include portions of the parishes of Enfield, Edmonton, and Southgate, and an amendment of their Act of 1867 in this respect. It is proposed to acquire additional land; to consolidate and convert the capital already sanctioned, and apply for more; and to make provision as to reserve and other funds, and the supply of gas, electricity, &c. An agreement is to be entered into with the Tottenham and Edmonton Gas Company for an alteration of their district.

Felixstowe and Walton Water.—The Urban District Council of Felixstowe and Walton, in Suffolk, will apply for power to purchase the undertaking of the Felixstowe and Walton Water Company, which will be dissolved and wound up. The Council will acquire all the privileges granted to the Company; and they seek to be exempt from the enactments limiting the profits of the undertaking. Authority to raise more money will be sought.

Filey Water and Gas.—The Urban District Council of Filey will seek authority to acquire the undertaking of the Filey Water and Gas Company, and supply water and gas in certain parishes to be defined in the Bill. The usual powers granted to gas and water companies will be applied for, as well as permission to raise more money.

Folkestone Gas.—Application is to be made by the Folkestone Gas Company for power to purchase certain lands for the construction of works for the manufacture and storage of gas and the treatment of residual products. In the Bill to be promoted, provisions will be included for the laying of mains in private streets, the supply and removal of stoves and fittings, and the sale of gas beyond the Company's limits and in bulk. The present capital is to be consolidated, and more will be asked for.

Folkestone Water.—The Folkestone Water Company purpose applying for power to construct new works consisting of a well and pumping-station in the parish of Lydden, another in the parish of Alkham, a service reservoir in the parish of Hawkinge, and a number of adits and pipe-lines. Additional lands will be required, as well as more capital. The Company desire to extend their present limits of supply, and to be exempt from giving a constant service in the added area. They will apply for authority to make and sell meters and fittings and to inspect the latter; also to purchase any mains or water-works belonging to any company or person within their district.

Folkestone Corporation (Water-Works Transfer).—The Corporation of Folkestone have notified their intention of applying for authority to purchase the undertaking of the Folkestone Water Company and carry it on, with all the privileges appertaining to it. In the event of their application being successful, the Company will be dissolved and wound up. The necessary borrowing powers will be included in the application.

Forres Water.—The Forres Water Company, Limited, will apply to be dissolved and re-incorporated with power to supply water in the Royal Burgh of Forres and in the parishes of Forres, Rafford, and Dallas, in the county of Elgin. The existing works will be maintained, and others—comprising the conversion of Loch Romach into a storage reservoir and the construction of an intake on the Black Burn, a well, and two conduits or pipe-lines—are to be carried out. Powers to impound and collect water, supply it in the ordinary way or in bulk, and levy rates and charges will be sought.

Frodingham Gas.—Application will be made for the incorporation of a Company with power to construct gas-works and supply gas in the parishes of Scunthorpe, Brumby, and Frodingham, in Lincolnshire,

and to acquire the gas undertaking of the Frodingham Iron and Steel Company. The Company will ask for authority to apply for a Licence or Provisional Order under the Electric Lighting Acts, and to use any of their funds for the purpose.

Gaslight and Coke Company.—The notice given by this Company of their intention to apply to Parliament for authority to consolidate their capital was so fully dealt with last week (p. 1122), that it is unnecessary to revert to the matter here.

Gloucester Gas.—The Gloucester Gas Company intend to apply for power to consolidate and increase their capital and extend their limits of supply, as defined in their Act of 1872. The Bill to be promoted will make provision for securing the payment and recovery of the Company's rates and charges, and the supply and fixing of meters, stoves, dynamos, &c.

Halifax Corporation.—The Corporation of Halifax intend to apply to Parliament for authority to construct new gas-works on lands to be acquired, and to manufacture and supply carburetted water gas. They also purpose asking to be allowed to give a free supply of gas to any consumer or person for illuminations on extraordinary public occasions, and to inspect interior fittings and meters; also to manufacture and supply dynamos and electric lighting appliances, and to amend their Electric Lighting Order of 1892 so as to enact that consumers of electricity shall provide and fix the necessary apparatus for controlling, distributing, and measuring the supply. Power will be sought to construct new water-works, comprising three reservoirs, to be situated upon the Walshaw Dean Water, and four aqueducts or pipe-lines, all in the parish of Wadsworth in the West Riding of York. Additional stock is to be issued.

Hamilton Water.—The Hamilton Water Commissioners desire to be authorized to carry out some additional works, comprising a reservoir on the Kype Water, partly in Avondale and partly in Lesmahagow, an embankment across that stream, two conduits or pipe-lines, and a road giving access to the reservoir. More money will be required.

Hartlepool Gas and Water.—The Hartlepool Gas and Water Company are desirous of constructing two new storage reservoirs and other works in the county of Durham. One reservoir will be situated on the Amerston Beck, to collect the waters of that beck and its tributaries at Crookfoot or Quaker Gill; and the other on the Dalton and neighbouring becks. There will be the necessary conduits or pipe-lines. Power will be asked to sell water in bulk and raise more capital.

Haslemere District Water and Gas.—Authority will be sought for the incorporation of a Company to supply water and manufacture and supply gas in Haslemere and in several adjacent places in the counties of Surrey, West Sussex, and Southampton. It is proposed to acquire the undertaking of the Haslemere Gas Company and to repeal certain powers granted to the Frith Hill, Godalming, and Farncombe Water Company and the Godalming Gas and Coke Company.

Heywood Corporation Water.—The Corporation of Heywood will apply for an extension of time for the completion of water-works authorized by their Act of 1867, and for further powers as to the construction of new works. In the Bill to be applied for, provisions will be made for the borrowing of money and the repeal and amendment of Acts.

Higham and Hundred of Hoo Water.—The object of the application intended to be made by the Higham and Hundred of Hoo Water Company is to amend section 4 of their Act of 1890 by the substitution, for the words "seven years," now standing in the section, of "ten years," or such other time as may be prescribed in the Bill or as Parliament may think fit to insert. They also wish to have power to refuse a supply of water to persons indebted to them in respect of other premises, and to reduce the interest payable upon consumers' deposits.

Ilford Improvement.—In a General Purposes Bill of which notice has been given by the Ilford District Council, provision will be made for furnishing a constant supply of water throughout the district, and for the repeal or amendment of any Act relating to the East London Water Company which will interfere with this object.

Ilkeston Corporation.—The Corporation of Ilkeston require power to carry out certain water-works, and to make further provisions in regard to their gas and water undertakings. It is proposed to repeal the Order of 1878, and to exclude the gas and water loans from calculations under the Public Health Acts. Additional borrowing powers will be sought.

Keighley Corporation.—The Corporation of Keighley wish for an extension of the time specified in their Act of 1891 for the completion of the Lower Laithe reservoir and other works sanctioned by the Keighley Water-Works Extension and Improvement Act, 1869, as altered by an Act passed in 1872, or some of them, as well as the time named for the construction of the works enumerated in the 1891 Act. Authority will also be sought for carrying out other works, taking and impounding the waters of certain streams, and altering the terms on which water is supplied to the Oakworth District Council. The Corporation wish to have their loans for gas-works purposes excluded from calculations of the amount they may borrow under the Public Health Acts.

Kettering Water.—The Kettering Urban District Council are desirous of acquiring the undertaking of the Kettering Water Company. They will accordingly apply for the necessary power to carry out the project and take up the supply of water in the district of Kettering and the parish of Weekley, improve the works, and frame regulations applicable to the consumers. Provision will be made for raising the money required.

Leyton Urban District Council.—In a General Purposes Bill for which the Leyton Urban District Council have given notice, they will ask for authority to make provision for the better supply of water to their district, and to be enabled, with this object, to contract and enter into arrangements with the East London Water Company, and so far as may be found necessary or expedient, require and compel them to afford a constant supply of water throughout the district.

Liskeard Corporation.—The Corporation of Liskeard desire to purchase the undertaking of the Liskeard Water Company, and to supply water within the borough and parish. The existing works are to be maintained and improved; and provision will be made for the borrowing of money for the purposes of the undertaking.

Maldon Water.—The Maldon Water Supply Company, Limited, desire to be dissolved and re-incorporated, with power to continue and maintain their present works and construct others; also to sell or let meters, and to supply water by this system. Provision will be made as to capital, of which more will be required for the undertaking.

Market Harborough Gas.—The Market Harborough Urban District Council are desirous of purchasing the undertaking of the Market Harborough Gas Company, Limited, and carrying it on with all the privileges granted to the Company; and they will apply for the necessary power to do this, and to raise more money. The Bill to be promoted will contain provisions enabling the Council to manufacture and deal in meters and fittings, dynamos, stoves, &c.

Matlock Urban District Council.—Authority will be sought by the Matlock Urban District Council for the purchase, by compulsion or agreement, of the undertaking of the Matlock Water-Works Company, Limited. In the event of arbitration taking place, directions will be given to the arbitrators as to the matters they are to specially consider. Supposing the purchase to be completed, the Company will be wound up, and the business carried on by the Council, who ask for the usual powers as to water supply. Additional works are proposed.

Middlesbrough Corporation Gas.—Power will be sought by the Corporation of Middlesbrough to extend their gas-works, and to acquire the necessary land for the purpose. The extensions include plant for the manufacture of carburetted water gas and the treatment of residual products; and authority will be applied for to use any of the existing gas lands for the former purpose. More money will be needed.

Mid-Kent Water.—The Mid-Kent Water Company, Limited, desire to be dissolved and re-incorporated, with power to maintain, extend, and enlarge the existing works and construct new ones. It is proposed to extend the limits of supply, and make provisions as to furnishing a constant service of water. The capital is to be re-arranged and consolidated; and power to raise more will be applied for. The Company will seek to prohibit the sinking of wells within their limits of supply, and to amend or repeal the South Kent Water Act, 1889, and the Higham and Hundred of Hoo Water Act of 1890.

Morley Gas.—The Morley Gas Company purpose applying for authority to include the township of Churwell in their limits of supply, and to acquire the undertaking of the Churwell Gas Company. The present works are to be maintained, continued, and enlarged; and power will be sought to construct new ones. The capital is to be consolidated.

Morley Corporation (Gas-Works Transfer).—Application will be made by the Corporation of Morley for power to purchase, by compulsion or agreement, the undertakings of the Morley and Churwell Gas Companies, or either of them; to maintain, improve, and extend all or some of the existing gas-works; and to supply gas, meters, and fittings. Provision is to be made for the borrowing of money, and for extending the periods for repaying that raised under existing Acts.

Newcastle and Gateshead Water.—The Newcastle and Gateshead Water Company will apply for power to construct certain new conduits in the county of Northumberland, in the city and county of Newcastle-upon-Tyne; and also for an extension of the time for the completion of works authorized by the Newcastle and Gateshead Water-Works Act, 1894. Additional capital will be required.

Newhaven and Seaford Water.—Application will be made by the Newhaven and Seaford Water Company, Limited, to be dissolved and re-incorporated. New works, consisting of a service reservoir in the parish of Piddinghoe, two pipe-lines, and a new road, are proposed; and additional lands and waters are to be acquired. The Company wish to extend their area of supply so as to include Piddinghoe. Provisions will be made for the protection of the works and water supply and for the regulation of fittings. The capital and borrowing powers are to be defined, and more money will be applied for.

Newhaven and Seaford Water Board.—The Urban District Councils of Newhaven and Seaford desire to be constituted a Water Board for the urban and rural districts, with authority to purchase the undertaking of the Newhaven and Seaford Water Company, Limited, with all the rights and privileges appertaining thereto. Power will be sought to maintain, continue, and improve the existing works, and construct new ones, comprising two pumping-stations, a covered service reservoir on Southease Hill, and three pipe-lines. Special directions are to be given to the arbitrators in the event of their appointment.

Newtown Water.—It is the intention of the Urban District Council of Newtown and Llanllwchaiarn, in Montgomeryshire, to apply for authority to acquire the undertaking of the Newtown Water Company, by virtue of any agreement come to between the parties before the passing of the Act. The Company will, of course, be dissolved. The usual powers are sought.

North Warwickshire Water.—It is proposed to apply for sanction to the incorporation of a Company for the construction of works and the supply of water in Fo'eshill and other places in Warwickshire. The usual privileges granted to suppliers of water will be sought; and the capital and borrowing powers are to be defined.

Northam Water.—The Urban District Council of Northam desire authority to construct additional water-works, comprising a storage reservoir and a filter-bed in the parish of Parkham, another reservoir in the parish of Northam, a pipe-line, and a road diversion. Provision will be made for interfering with land, springs, streams, &c., for supplying compensation water, and for preventing waste.

Norwich Water-Works.—Authority will be sought by the City of Norwich Water-Works Company to construct new works, consisting of a subsiding and a service tank, and to take lands for the purpose. Further capital will be required.

Paignton Improvement.—In a Bill of which notice has been given by the Urban District Council of Paignton, it is proposed to insert a clause specifying that a supply of water by the Council for domestic purposes is not to include water used for horses and washing private carriages in stables belonging or attached to dwelling-houses; and another to provide for the payment of water rates and rents half-yearly instead of quarterly.

Plymouth and Stonehouse Gas.—As mentioned in the "JOURNAL" last week, the Plymouth and Stonehouse Gas Company intend to apply for power to extend their limits of supply so as to include the parishes of Egg Buckland and Tamerton Folliot and the tithings of Pennycross and Compton Gifford. Lands in the parish of Charles, comprising the site of premises known as the Coxside Tannery, are to be acquired for gas-works purposes. It is proposed to consolidate and convert the existing stock and apply for more capital.

Redhill and Reigate Gas.—Application is to be made for authority for the sale of the undertaking of the Reigate Gas Company, Limited, to the Redhill Gas Company, Limited, who are to carry on the amalgamated concern. The Redhill Company will apply for power to maintain the existing works and construct new ones. Certain specified lands are to be acquired compulsorily or by agreement. The capital is to be consolidated, and more will be applied for. Provision will be made for the formation of reserve, insurance, contingency, and accident funds. The price to be charged for gas and the dividends to be paid are to be revised; the Redhill Gas Act, 1865, is to be altered in this respect; and the provisions of the Gas-Works Clauses Act, 1871, are to be applied to the Company, whose name will be changed.

Reigate Gas.—Authority will be sought to dissolve and re-incorporate the Reigate Gas Company, Limited, with power to manufacture and sell gas, maintain, continue, and extend the works, and supply meters and fittings. The capital is to be arranged and increased.

Rhymney and Aber Valleys Gas and Water.—Authority will be sought for the incorporation of a Company for the construction of water-works and the supply of gas and water in certain parishes in the counties of Glamorgan, Monmouth, and Brecon. Additional lands are to be purchased for gas-works purposes. The Company will ask for power to acquire the undertakings of the Rhymney Valley Gas and Water Company, the New Tredegar Gas and Water Company, the Rhymney Gas Company, Limited, the Caerphilly Gaslight, Coke, and Water Company, Limited, and the water-works of the Rhymney Iron Company, Limited. It is proposed to ask for an extension of the time specified by the Rhymney Valley Gas and Water Act, 1892, for the compulsory purchase of lands and the completion of the works authorized by that Act, as extended by the Rhymney Valley Gas and Water Act of last session. Other Acts and Orders affecting the Companies concerned will be amended where necessary.

Rochdale Corporation Water.—The Corporation of Rochdale desire to purchase the undertaking of the Todmorden Water Company; and they will apply for the necessary powers. In the event of these being granted, the Company will be dissolved and wound up. The existing works are to be maintained and new ones carried out; the latter comprising three storage and two covered service reservoirs, and various auxiliary conduits or pipe-lines. Authority will be sought to take and impound the water from a number of streams specified in the notice, and to distribute it within the Corporation's limits, or sell it in bulk to any local authorities or bodies. Provision will be made for borrowing money and levying rates and charges.

St. Anne's-on-the-Sea Gas.—Application will be made by the St. Anne's-on-the-Sea Gas Company, Limited, to be dissolved and re-incorporated with power to supply gas in the urban district of St. Anne's-on-the-Sea and so much of Lytham as is not comprised within the limits of the Lytham Improvement Act, 1847. Provisions will be made in regard to the inspection and regulation of meters, pipes, and fittings, and the exemption of fittings, &c., from distress.

St. Helens Corporation.—In a General Purposes Bill of which notice has been given by the St. Helens Corporation, provision will be made for the formation of reserve funds in connection with the gas and water undertakings; for the sale of gas and electricity beyond the borough; and for the framing of bye-laws and regulations in regard to the fittings used in the supply of gas, electricity, and water, in order to ensure the safety of the consumers and the prevention of waste.

Sheringham Gas and Water.—The Sheringham Gas and Water Company, Limited, desire to be dissolved and re-incorporated. The old Company's powers and privileges are to be transferred, and the concern carried on by the new one, the capital of which is to be classified and defined.

Southampton Gas.—The Southampton Gas Company intend to apply for power to purchase additional lands for gas-works purposes, extend their limits of supply so as to include Lyndhurst and several other places, and manufacture and sell or let gas-meters and other appliances. Users of gas-engines are to provide anti-fluctuators. The share capital is to be consolidated and the debenture stock converted, and the total nominal amount increased. Certain sections of the Gas-Works Clauses Act, 1871, relating to the recovery of rents are to be applied to the Company's undertaking. Authority will be sought to apply for power to produce and supply electricity, to withhold a supply of gas from certain consumers, to make agreements with local bodies or persons for laying mains for carrying water or oil, or effecting telegraphic and other communication between different parts of the Company's works, and to purchase or hire railway waggons for the conveyance of coal. The notice given by the Company is very comprehensive. More money will be required.

Southend-on-Sea Gas.—Application will be made by the Southend-on-Sea Gas Company for authority to purchase additional lands, in the parishes of Prittlewell and Southchurch, for the erection of gas-works, in conjunction with other lands now held. The Company wish for power to make a jetty, provide and maintain a station for generating electric power, and enter into agreements with any gas or other company, local authority, or person supplying electricity, electric energy, or power for a sale in bulk; also to supply electricity within their gas limits. Authority will be sought for the Corporation of Southend to transfer to the Company all or any of the powers conferred by the Southend Electric Lighting Order, 1891, so far as they are now in force. The present capital is to be consolidated and converted, and more will be applied for. The Company's Act of 1877 is to be repealed with reference to the general meetings and the voting thereat. Other provisions of the Bill to be promoted relate to the measurement of gas, and the supply of meters, stoves, and fittings.

Southend Water.—The Southend Water Company desire to extend their limits of supply so as to include the parishes of Bower's Gifford, Vange, and Fobbing, in Essex, or some portions thereof. New works are to be constructed, and more capital will be required.

Southwark and Vauxhall Water.—The Southwark and Vauxhall Water Company will apply for further powers to enable them to perform the obligations imposed upon them by Parliament in relation to the supply of water. They propose to construct two new storage reservoirs and other works in pursuance of their Act of last session. One will be in the parish of Walton-upon-Thames, and have a superficial water area of 247,100 square yards; and the other will be situated partly in the above-named parish and partly in West Molesey, and have a superficial area of 316,530 square yards. The auxiliary works consist of a pumping-station at Walton, and eight aqueducts or pipe-lines. Authority will be sought for the intersale and exchange of lands and water with other Metropolitan Water Companies, and for making permanent the temporary enactments of the Company's Act of last session as to drawing water from the Thames. The Company wish to have power to take from the river, in any day of 24 hours, such quantity of water (whether or not in excess of the 24,500,000 gallons which they are now authorized to draw) as may be required by them to fulfil their statutory obligations. Provision will be made for the confirmation or modification of agreements with the Conservators of the Thames, for the payments to be made to them, and for the raising of additional capital.

Staines Reservoirs.—The Staines Reservoirs Joint Committee intend to apply to Parliament for power to enlarge two reservoirs (Nos. 1 and 1A) authorized by the Staines Reservoirs Act of 1896, by extending the embankment on the southern side of the former and the northern side of the latter a distance of about 9 chains eastwardly; and to abandon the construction of so much of the works connected with these reservoirs as will be rendered unnecessary by the above-mentioned extensions. Other works which the Committee desire to carry out comprise a line of rails, the diversion of a road in the parish of Hanworth; alterations of road levels in the parishes of Littleton and Ashford; a conduit or pipe-line commencing in Staines and terminating in the parishes of Laleham and Littleton; and another pipe-line starting from a different point and ending at about the same place as the former conduit. It is proposed to amend the Act of 1896 as regards the time for making up the half-yearly accounts, and as to the issue of stock by the Committee, the expense of which it is sought to meet out of the premiums obtained. Doubts having arisen as to the power of trustees to invest trust funds in the stock of the Committee, provision will be made for setting these at rest. It is proposed to increase the nominal amount of debenture stock created by the Act of 1896, and the total amount which the Committee are empowered to raise. Certain lands specified are required; and power will be sought to obtain them. The River Ash is to be diverted, and authority to interfere with roads is to be applied for.

Stirling Gas.—The Stirling Gas Company seek to be dissolved and re-incorporated; the new Company to have power to sell, lease, exchange, or otherwise dispose of lands and property. Authority will be sought to manufacture and supply gas within certain limits, to maintain the existing works and construct others, and generally to carry on the business of gas supply. Further capital will be asked for.

Swansea Gas.—The Swansea Gas Company intend to apply for power to raise additional capital, and to convert and consolidate that which has been already sanctioned. Authority will be sought to acquire certain lands by agreement; manufacture and let on hire stoves, meters, &c.; make up the accounts yearly instead of half-yearly, and hold annual meetings; reduce the interest payable on deposits made with the Company; and refuse a supply of gas to persons in debt for other premises.

Thanet Gas.—The Thanet Gas Company wish to purchase by agreement certain lands whereon to construct additional works for the manufacture and storage of gas and the treatment of residual products. The existing capital is to be consolidated and converted, and more will be applied for. Authority will be sought to amalgamate with other companies; to accept a transfer of powers conferred upon the Corporation of Margate by their Electric Lighting Order of 1896, and exercise them; and to hold annual instead of half-yearly meetings. The other provisions of the Bill to be promoted will be of the usual nature.

Todmorden Corporation Water.—The Corporation of Todmorden intend to apply for power to make and maintain certain water-works, comprising two reservoirs and an aqueduct or pipe-line. The necessary lands are to be purchased, compulsorily or by agreement. Provisions will be made for supplying compensation water, breaking up streets, &c. Authority will be sought to supply water in the borough of Todmorden and the parishes of Blackshaw and Erringden, and to extinguish the right of the Todmorden Water Company and the Corporation of Rochdale, and all other authorities, companies, or persons, to distribute water for sale within those limits. Further borrowing powers will be required.

Todmorden Corporation (Water-Works Transfer).—The Corporation of Todmorden desire to purchase, by compulsion or agreement, the undertaking of the Todmorden Water Company; to acquire the exclusive right to supply water within the borough of Todmorden and the parishes of Blackshaw and Erringden, in the West Riding of the county of York; and to extinguish the right of the Rochdale Corporation, and any other authorities, companies, or persons, to distribute water for sale within those limits. The Corporation seek authority to levy and recover rents, rates, and charges for the supply of water, meters, and fittings, and to increase, alter, or reduce the charges sanctioned by the Company's Act. Borrowing powers will be sought.

Tottenham and Edmonton Gas.—Application will be made by the Tottenham and Edmonton Gas Company for power to raise additional capital, and to consolidate their existing stocks, with a consequent alteration of dividend. They will also seek authority to generate, provide, and supply electric current or electrical energy, or to apply for permission to do so, within their gas limits, or such area as may be defined in the Bill, and to recover rates and charges in respect thereof. Various Acts and Orders will be amended so as to confer upon the Company the necessary rights and privileges for effecting the objects they seek.

Tynemouth Corporation Water.—The Corporation of Tynemouth are desirous of obtaining authority to carry out the new scheme of water supply from the River Font, to which reference has been made on several occasions in our columns. The works comprise a reservoir to be situated in the parishes of Hollinghill, Greenleighton, and Ritton White House, and to be formed by means of an embankment across the Font; an outlet and a flood-water tunnel and a flood-water channel; a gravitation main between Ritton White House and Chirton, in the borough of Tynemouth; a service reservoir at Chirton; and a line of pipes therefrom to a point in the parish of Preston on the north side of the reservoir of the North Shields Water Company. Provision

will be made for the protection of the intended gathering-ground and sources of supply, and also the owners of property whose interests will be affected by the scheme. Authority will be sought to supply other bodies whose districts are situated in the neighbourhood of the intended works, and also to raise more money.

Waterford Gas.—The City of Waterford Gas Company will seek authority to raise additional capital and convert the present "A," "B," and "C" shares into stock. They will at the same time apply for a Provisional Order or Licence to supply electricity. Doubts having arisen as to the meaning of the word "fitting" or "fittings" as used in the City of Waterford Act of 1858, this term is to be defined. Provision is to be made for the reduction of the price of gas and the abolition of the system of discounts. The stock to be created is to be offered at par to the consumers before it is put up for sale by auction or tender.

Wath-upon-Dearne Urban District Council.—Application will be made by the Urban District Council of Wath-upon-Dearne to acquire the undertaking of the West Melton Water-Works Company, Limited; to maintain, continue, and extend the existing works; and generally to carry on the business of the Company, which will be dissolved. Section 8 of the Dearne Valley Water Act, 1880, is to be amended. Power to borrow more will be applied for.

Wey Valley Water.—Application will be made for the dissolution of the Wey Valley Water Company, Limited, and the incorporation of another Company with power to supply water in certain parishes in Surrey and Hampshire. New works, consisting of wells and pumping-stations, service reservoirs, and pipe-lines, or some of them, are to be constructed. The limits of the Frimley and Farnborough District Water Company are to be extended; and they are, if thought desirable, to carry out portions of the above-named works, and co-operate with the Wey Valley Company. The works constructed by the Farnham Water Company in the parish of Farnham Rural are to be sanctioned and confirmed, and that Company's limits also are to be extended. Authority will be sought for the Wey, Frimley, Farnham, Aldershot, Woking, Wokingham, and Frith Hill Companies, or any two or more of them, to enter into agreements with respect to any of the objects and purposes of the intended Act in which they are respectively interested. Additional capital will be required by the Frimley and Farnham Companies; and the 1893 Act of the former Company, as well as other Acts, is to be amended.

Whitwick and Coalville Gas.—The Whitwick and Coalville Gas Company seek to be dissolved and re-incorporated. The present works in Whitwick are to be maintained and enlarged; and application will be made for the usual power to supply gas, meters, fittings, &c., in various places in Leicestershire. The existing capital is to be regulated and defined, and more will be applied for.

Wigan Corporation.—In an Improvement Bill of which the Wigan Corporation have given notice, provision will be made for allowing certain rebates on the price of gas, and for acquiring certain lands in the township of Haigh for the purposes of the water undertaking.

Wishaw Water.—The Commissioners of the burgh of Wishaw intend to apply for power to provide an additional water supply for the town. The present works are to be transferred to the Commissioners, and authority will be sought for the construction of additions and for raising the necessary money. An alteration is to be made in the existing rates and charges.

Wymondham Water.—Application will be made for the incorporation of a Company to construct works and supply water in Wymondham and other places in Norfolk, with the usual powers and privileges.

Yeovil Gas.—The Yeovil Gas and Coke Company, Limited, desire to be dissolved and re-incorporated, with power to supply gas in the parishes of Yeovil, Yeovil Without, Preston Plucknett, and Barwick, or some or one of them, in Somersetshire. It is proposed to convert, consolidate, and increase the nominal amount of the existing capital, and to ask for authority to raise more money. New works for the manufacture of gas and residual products are to be constructed; and various incidental powers will be applied for.

Yeovil Corporation.—The Corporation of Yeovil are desirous of acquiring the undertaking of the Yeovil Gas Company, and supplying gas, meters, fittings, &c., within the borough of Yeovil and in several adjacent parishes and places. They also wish to be empowered to provide all such steam, gas, or other engines, machinery, and appliances as they may deem expedient for producing and supplying electric current or energy in the gas area. Water-works, consisting of two collecting ponds, a reservoir, and pipe-lines, are to be constructed.

York Gas.—The York United Gas Company will apply for power to raise additional share and loan capital, and consolidate and convert that which has been already authorized.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE FOR PROVISIONAL ORDERS (SESSION 1898).

Under the Gas and Water Works Facilities Act, 1870.

Broughton-in-Furness Water.—Application will be made by the Broughton-in-Furness Water Company, Limited, for power to acquire certain lands and easements, construct water-works, and supply water in the town of Broughton-in-Furness and in the hamlets of Sykehouse and Kepplewrayn. The water is to be procured from springs at Woodhouse, near Corglinhurst, in Broughton West. Authority will be sought to sell the undertaking to the Local Authority.

Budleigh Salterton Gas.—Application will be made by the Budleigh Salterton Gas Company, Limited, for power to maintain and continue their existing works and construct others for the purpose of manufacturing and supplying gas within the urban district and parish of Budleigh Salterton. Provision is to be made for selling gas in bulk, supplying fittings and other apparatus, and contracting for doing work in connection therewith. The existing capital is to be defined, and more will be applied for.

Cannock Gas.—The Cannock, Hednesford, and District Gas Company, Limited, desire power to maintain and continue gas-works, and to supply gas in the parishes of Cannock, Cheslyn Hay, and Great Wyrley, in Stafford. Authority will be sought to supply meters, fittings, &c., to sell gas in bulk, and to levy rates and charges. The amount of the Company's capital is to be fixed by the Order; and permission to raise more will be applied for.

Churwell Gas.—The Churwell Gas Company will apply for power to renew, maintain, and continue their existing gas-works, convert residual products, and manufacture and supply gas in the township of Churwell, in the borough of Morley, in Yorkshire. In the proposed Order, provisions will be included for the sale of gas in bulk, the supply of fittings and apparatus, and the acquisition of patent rights. The existing capital is to be defined, and more will be required.

Coatbridge Gas.—Application will be made by the Coatbridge Gas Company to raise additional capital, and amend their Act of 1877.

Colwall Gas.—The Colwall Gas Company, Limited, will apply for power to maintain and continue their existing works, and to construct a new gasholder and make other additions, including plant for the treatment of residual products. Authority will be sought to supply gas generally in Colwall and Coddington, in Herefordshire, as well as in bulk; also to supply meters, fittings, stoves, &c. The capital is to be defined, and more will be required.

Crossgates, Halton, and Seacroft Gas.—The Crossgates, Halton, and Seacroft Gas Company will apply for power to maintain and continue their existing works, and supply gas in the parish of Crossgates, in the West Riding of the county of York, and in several contiguous places. Additional capital will be applied for.

Freshwater Gas.—Application will be made by the Freshwater Gas Company, Limited, for authority to construct and maintain their works, and to supply gas in Freshwater and Totland, in the Isle of Wight. The capital is to be defined, and more will be applied for.

Great Marlow Gas.—The Great Marlow Gas Company, Limited, desire authority to maintain and continue their works, and to supply gas in Marlow and several adjacent places. It is proposed to define and regulate the existing capital, and make provisions with regard to it and the dividend to be paid, and also as to reserve and insurance funds.

Ightham and Wrotham Water.—Application will be made by certain parties to be named for power to construct works for the supply of water in the parishes of Ightham, Wrotham, and Plaxtol, in Kent, and to levy rates and charges therefor. The capital and borrowing powers are to be fixed and defined, and provision will be made for raising more money.

King's Lynn Gas.—Authority will be sought by the King's Lynn Gas Company to construct new works for the manufacture and storage of gas and residual products. Additional capital and enlarged borrowing powers will be applied for.

Portsmouth Water.—The Borough of Portsmouth Water-Works Company intend to apply for power to raise additional capital and to purchase certain lands by agreement.

St. Neots Water.—The St. Neots Water Company intend to apply for power to construct new works, comprising a well or wells and a pumping-station, a covered service reservoir, and two pipe-lines. Additional capital will be needed for these and the general purposes of the undertaking.

Slough Gas.—The Slough Gas Company intend to apply for power to construct and maintain works for the manufacture and storage of gas and residual products, and to acquire certain lands in the parish of Upton-cum-Chalvey, in Buckinghamshire. The existing capital or any additional money they may be authorized to raise is to be applied for the purpose.

South Hayling Water.—The South Hayling Water Company, Limited, wish to abandon the works authorized by their Order of 1895, construct and maintain others which are defined, and extend their limits of supply so as to include the whole of Hayling Island. The name of the Company is to be changed, and the above-named Order amended.

Whitchurch (Salop) Gas.—The Whitchurch Gas Company, Limited, will apply for power to maintain, continue, and enlarge their existing works for the manufacture of gas and residual products, and supply gas in the parish of Whitchurch, in Shropshire. Authority will be sought to levy rates and charges, break up roads, deal in gas meters and fittings, acquire patent right, and enter into agreement with local authorities for the sale of gas in bulk. The capital is to be fixed and defined; and more will be asked for.

Wrexham Water.—The Wrexham Water Company intend to apply for power to raise additional capital, and to amend their Act of 1864.

Under the Electric Lighting Acts, 1882 and 1888.

Applications will be made under the above-named Acts for powers in regard to the supply of electricity for lighting and other purposes in the following places: Airdrie, Aldershot, Aston Manor, Barnes, Batley, Bermondsey, Bethnal Green, Birkdale, Brechin, Bridgwater, Buxton, Chelmsford, Chichester, Chislehurst, Chorley, Colne, Crewe, Darlington, Dartford, Doncaster, East Ham, East Stonehouse, Gourock, Gravesend, Greenock, Greenwich, Hamilton, Hastings, Hereford, Holborn and St. Giles's, Holborn District, Hornsey, Ilford, Ilfracombe, Leamington Spa, King's Norton, Kingswinford, Leigh-on-the-Sea, Lewes, Lewisham, Lowestoft, Maidenhead, Marylebone, Melton Mowbray, Middlesbrough, Mitchelstown, Montrose, Norwich, Oldbury, Ossett, Partick, Penarth, Perth, Peterborough, Prescot, Preston, Ramsgate, Rawmarsh, Rochdale, Rotherham, Rotherhithe, Rothesay, Ryde, St. Albans, St. Anne's-on-the-Sea, Smethwick, Staffordshire, Stourbridge, Warrington, West Bromwich, Westgate-on-Sea, Weston-super-Mare, Weymouth and Melcombe Regis, and Whiston Rural District, Worcestershire.

NOTICES OF APPLICATIONS TO THE LOCAL GOVERNMENT BOARD (SESSION 1898) FOR PROVISIONAL ORDERS.

Under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875.

Haworth Gas.—The Urban District Council of Haworth are desirous of holding additional lands for the purposes of their gas undertaking, and erecting works for the manufacture and storage of gas and residual products; and they will apply for a Provisional Order to authorize the carrying out of the project. If, however, the Board think fit, the objects can be accomplished by amending the Haworth Local Board of

Health Act, 1872, and the Haworth Order of 1880; and the Council will apply for one on these lines.

Selby Gas.—The Selby District Council intend to make application for power to acquire additional lands for the purposes of their gas undertaking, and to erect works for the manufacture of gas and residual products. Authority will be sought to apply the gas reserve fund to the purchase of such lands and to the erection of storage plant thereon; also to enlarge the existing borrowing powers and raise more money.

Wenlock Gas.—Application is to be made by the Corporation of Wenlock, acting as the Urban District Council, for authority to acquire the gas-works and plant now belonging to Mr. C. G. M. Gaskell, of Much Wenlock, trading under the style of the Much Wenlock Gas-Works, and supply gas within the Wenlock Sanitary Division of the Borough. The usual powers granted to gas companies will be sought.

Tralee Gas and Water.—Application will be made to the Local Government Board for Ireland by the Tralee Urban Sanitary Authority for power to erect and maintain the Tralee Gas-Works, and for sanction to the sum of £8000 borrowed thereon, and the issue of debentures therefor. Powers will be sought to supply light for public and private purposes, make a gas-rate and distrain for it, extend the Curraheen Water-Works, and levy a water-rate.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Friday, Nov. 26.

(Before Mr. Justice MATHEW *and a Special Jury.)*

Prosser v. The Gaslight and Coke Company.

This was an action by a discharged servant to recover damages for (1) wrongful dismissal, (2) false imprisonment on a criminal charge, and (3) malicious prosecution. Plaintiff also claimed to recover back the sum of £127 17s. 4d., which he had paid to the guarantee fund. The charge of wrongful dismissal was practically abandoned during the hearing of the case.

Mr. DICKENS, Q.C., Mr. PURCELL, and Mr. P. STEPHENSON appeared for the plaintiff; Mr. CARSON, Q.C., Mr. WILLES CHITTY, and Mr. TRAVERS HUMPHREYS represented the defendants.

Mr. *H. J. Prosser*, the plaintiff, said that until recently he was in the employ of the Company, having entered their service in 1873 as a messenger boy, at a salary of 13s. a week. In 1874, he was promoted to the post of district office clerk, at a salary of 16s. a week. In 1876, he was made assistant inspector, at a salary of 30s. per week; in 1881, inspector, at £100 a year; in 1888, assistant collector, at £150; and in May, 1889, he was promoted to the post of collector, at a salary of £170, rising by annual increments of £15 to £400. At the time of his dismissal, he was receiving £275. His duty was to collect monies from consumers, to give receipts, and to enter the amounts on a cash return sheet. These sheets were forwarded to the Company about three times a week; the money being paid into the National Bank. In June, 1896, he began to be irregular in forwarding the bankers' receipt with the return-sheet, because he had got behind. The Company had not lost a single penny which he had collected on their behalf. He had paid in various sums, amounting in all to £127 17s. 4d., to the guarantee fund. He received a cheque for £42 1s. 6d. from the Royal Aquarium, and one for £5 12s. 9d. from Mr. Osterwritter. Witness was asked to produce his books; and after being detained in the office for about an hour, he was given into custody for embezzling these amounts, and for falsifying accounts. Being committed for trial, the Grand Jury threw out the bill.

Cross-examined: He did not know what became of the money which he collected, but supposed he had spent it. This was not done intentionally. He was warned in July about irregularities in connection with the return-sheets, and payments into the bank. His deficiency, which was then about £20, afterwards increased to £90. He probably lost the money through carelessness. The receipt for the Aquarium cheque was dated Nov. 21; but witness altered the counterfoil to the 25th. This was done with a view of deceiving the Company; and the cheque was left out of the return, so that he should not have to pay the money then. He had borrowed £100 from a friend to repay the amount due to the Company, and this was still owing.

Mr. CARSON submitted that the Company, having regard to the duty they owed to their shareholders and the public, were amply justified in the course they took.

The Jury found that plaintiff had used the cheque for £42 1s. 6d. to conceal previous defalcations, whereupon

His LORDSHIP said this disposed of the charges of false imprisonment and malicious prosecution. Verdict on these points would be entered for the defendants. There only remained the question of the indemnity.

Mr. CHITTY said he did not think there could be any question about this. The bond prescribed that the amount should be forfeited unless plaintiff should faithfully conduct himself in all matters relative to the concerns of the Company.

Mr. STEPHENSON pointed out that, under the rules of the guarantee fund, the Company were only entitled to retain the money in the event of loss occurring.

His LORDSHIP postponed the further consideration of the point.

Saturday, Nov. 27.

On the case coming before the Court to-day for argument on the point of law, it was stated that, having regard to the finding of the Jury, the plaintiff would not further contest the matter.

His LORDSHIP thereupon entered judgment for the defendants.

Damages for Injuries Caused by a Gas Explosion.

At the Westminster County Court, on Monday last week, Mr. Lumley Smith, Q.C., and a jury had before them the case of *Donovan v. The Gaslight and Coke Company*, in which the plaintiff sought to recover damages for injuries alleged to have been sustained by her through the negligence of the defendants' servants. Early in the present year Mrs. Donovan had an automatic prepayment gas-meter and a cooking-stove from the Company; but as the meter did not act properly, some workmen were sent to fix a new one. During this operation, as she stated, several taps were turned on and jets lighted. After the men had left, she went to use the stove, and on opening the oven door an explosion occurred by which she was severely burned; and as compensation she first claimed £25, and afterwards £50. The theory put forward on her behalf was that the workmen turned off the tap on the supply-pipe and the two ring-burner taps, but forgot the one in the oven. She asserted that no one went into the basement of the house after the workmen had gone until she went there to light the stove; and she told his Honour that after the accident she saw the oven tap full on. The defence was that the men only lighted a burner over the mantel-piece in the kitchen, to see if the new meter was properly connected, and then turned it out. After this the meter was examined, and the index did not record any gas passing through. In the result, the Jury found for the plaintiff for £50; and judgment was entered accordingly, with costs. It transpired in the course of the hearing that the Company have now out on hire 63,000 stoves on the automatic prepayment principle.

Incorrect Weights and Measures in Gas-Works.

At the Torquay Petty Sessions last Tuesday, the St. Marychurch Urban District Council were summoned for having in their possession at the gas-works an unjust weight and untrue spring balance and weighing-machine. Inspector Holdway stated that a 56-lb. weight which he found at the gas-works was 3 oz. 10 drachms light. The spring balance was very much out of order, and varied from 1½ lbs. slow to 3½ lbs. fast; while with the weighing-machine he could not get two weighings alike. There had been gross neglect of the regulations, a copy of which was in the Manager's office. Mr. T. Evans, the Manager of the gas-works, said he was ignorant that the articles were out of order. He had instructed the men to examine them, and report to him if anything was wrong; but they had not done so. The spring balance had not been used three times during the past year. A fine of £2 was inflicted; and the weight and faulty machines were ordered to be forfeited. A further charge of having two unstamped weighing-machines was preferred against the Council; and an additional fine of £1 was imposed.

The Sentence on a Gas Manager.

In noticing the above matter last week, we stated that the sentence of death passed upon William Scott Stormonth at the October sessions of the Central Criminal Court had been commuted to one of ten years' penal servitude. We now learn that the sentence is for life.

Abingdon Gas Company.—The Directors of the Abingdon Gas Company have allotted £2000 in 4 per cent. debenture bonds to replace others on which 5 per cent. has been paid. The bonds, of £50 each, were issued at premiums ranging from 2½ to 4 per cent.

Scarborough Gas Company.—An extraordinary general meeting of the shareholders of this Company was held yesterday week, when it was resolved to borrow £7000 on mortgage in respect of the additional capital issued under their Act of 1895. The Chairman (Mr. B. Fowler) stated that the money was going to be issued at 3½ per cent., repayable in twenty years; and it was needed to meet some heavy expenses incurred in the erection of a new gasholder.

The Supply of Water at the Recent City Fire.—At the meeting of the London County Council last Tuesday, various questions were asked with reference to the serious fire which occurred in the City on the 19th inst. One was as to whether the supply of water was not inadequate in the early stages of the outbreak. Colonel Rotton, the Chairman of the Fire Brigade Committee, in the course of his reply, said he was accompanied by the Chairman of the Council (Dr. Collins) when he visited the scene, and he saw that there was plenty of water in every place. The extent to which the New River Company's resources were drawn upon may be gathered from a letter sent to the papers by the Clerk to the Company (Mr. J. Searle), who states that from the outbreak up to the morning of the 24th inst., the quantity of water taken from the mains for extinguishment was 15 million gallons, equal in weight to approximately 67,000 tons. The whole of this great bulk of water was furnished by the Company, who, as Mr. Searle points out, do not receive any payment for it, though an impression to the contrary seems to prevail.

Budleigh Salterton Gas Supply.—Notice having been given by the Budleigh Salterton Gas Company of their intention to apply to the Board of Trade for a Provisional Order empowering them to maintain and continue gas-works and to manufacture and supply gas in the parish of Budleigh Salterton, opposition has been threatened by the District Council, who have demanded a number of concessions from the Company, and have objected to several of the provisions of the proposed Order. After considerable discussion, it was decided early this month to invite Mr. Padfield, of Exeter, as representing the Company, to meet the Council, with a view to a settlement of the points in dispute. The meeting took place, and the result was reported at a further meeting of the Council. Mr. W. Kempson, who presided, said it was found that the points of difference were narrowed down to two—viz., the illuminating power and the price. The Council wished the illuminating power to be 15 candles, and the price 4s. 6d. per 1000 cubic feet for private consumers, and 4s. for public lighting. Mr. Padfield, however, refused to concede more than 14 candles, and he would not agree to anything less than 5s. per 1000 cubic feet as the maximum price, whether for public or private lighting. For a place like Budleigh Salterton, with a small consumption, he contended that this was a very fair offer. This was eventually agreed to by the casting vote of the Chairman, and a formal resolution, empowering the Company to apply for the Order, was carried without dissent.

MISCELLANEOUS NEWS.

THE METROPOLITAN WATER SUPPLY COMMISSION.

First Day—Monday, Nov. 22.

(*Before Viscount* LLANDAFF, *Chairman, Sir* J. E. DORINGTON, Bart., M.P., *Sir* G. B. BRUCE, M.Inst.C.E., *Major-General* A. DE COURCY SCOTT, R.E., *Mr.* A. DE BOCK PORTER, C.B., *Mr.* H. W. CRIPPS, Q.C., and *Mr.* R. LEWIS.)

As briefly recorded in the "JOURNAL" last week, the Royal Commission on the Metropolitan Water Supply held its first sitting in the Moses Room of the House of Lords on the above-named day. The only Commissioner absent was the Right Hon. J. W. Mellor, Q.C., M.P. Mr. Cecil Owen, the Secretary of the Commission, was in attendance.

The terms of the reference have been already given in our columns; but it may be of interest to reproduce them. The Commissioners are charged to inquire—

1.—Whether, having regard to financial considerations and to present and prospective requirements as regards water supply in the districts within the limits of supply of the Metropolitan Water Companies, it is desirable, in the interests of the ratepayers and water consumers in those districts, that the undertakings of the Water Companies should be acquired and managed either (*a*) by one authority or (*b*) by several authorities; and, if so, what should be such authority or authorities. To what extent physical severance of the works and other property and sources of supply of the several Companies, and the division thereof between different Local Authorities within the limits of supply, are practicable and desirable; and what are the legal powers necessary to give effect to any such arrangements.

2.—If the undertakings are not so acquired, whether additional powers of control should be exercised by local or other authorities; and, if so, what those powers should be.

3.—Whether it is practicable to connect any two or more of the different systems of supply now administered by the eight Metropolitan Companies; and, if so, by whom, and in what proportion, should the cost of connecting them be borne, and what are the legal powers necessary to give effect to any such arrangement.

The following are the Counsel engaged: Mr. POPE, Q.C. and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and Southwark and Vauxhall Water Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Lord R. CECIL for the Hertfordshire County Council; and Sir R. NICHOLSON for the Middlesex County Council.

On the Commissioners taking their seats,

Mr. BALFOUR BROWNE said Mr. H. L. Cripps, the Parliamentary Agent of the London County Council, was in attendance to give evidence. He proceeded to ask if it were understood that the other legal gentlemen present would have the right, after the Chairman and the other members of the Commission had questioned the witness, to cross-examine him.

The CHAIRMAN said the Commission would, he thought, decide that point when the question arose.

Mr. *H. L. Cripps*, the Parliamentary Agent to the London County Council, was then examined by the Chairman. He said he had been concerned, from 1871 till now, in the parliamentary business, first of the Metropolitan Board of Works, and then of the London County Council. Since 1880, practically, he had had entire charge of these proceedings; so that he had had every opportunity of becoming cognizant of all the parliamentary proceedings in relation to the water question. He was present now on behalf of the County Council, to give the Commission such information as he possessed, and as they thought relevant to the subject.

The CHAIRMAN: I gather that the London County Council are in favour of solving the question of the Metropolitan Water Supply by purchase of the existing undertakings.

Witness: Yes. Continuing, he said that their view, in that sense, was expressed in a Bill which they submitted to Parliament in 1895, and again in 1897. There had been, however, considerable division of opinion on the Council with reference to these Bills. The last decision of the Council on the water question was in respect of the recommendation of the Water Committee, on the 16th of July, 1897. Witness then went at some length into these recommendations, and the discussion which took place upon them; the general result being that a majority of the Council voted in favour of the immediate purchase of the undertakings of the Companies. In considering this question of purchase, the Committee of the Council desired to be advised as to the legal position and the parliamentary history of the various Companies; it being thought that that would be the best course to pursue. Witness accordingly made a report on the subject, which the Committee considered. The Committee, at the outset, were much impressed with the report and recommendations of Sir William Harcourt's and Sir M. W. Ridley's Committees. The report of Sir William Harcourt's Committee included a paragraph in which three methods of dealing with the question were suggested—by competition, by regulation, and by purchase. After consideration, the Council came to the conclusion that the introduction of an independent water supply, which must be in competition with the existing Water Companies, was open to so much difficulty that it was better to set this suggestion aside. As to regulation, of course, much would depend on what "regulation" meant. But it was felt that this would not be at all likely to afford a final settlement; and so the question of purchase was considered. It had been the clear policy of Parliament, for years past now, to favour the transfer of water undertakings to local authorities. This policy, he thought, they would find expressed in nearly all the Bills introduced since 1880; for in all these Bills, care had been taken by the Committees of Parliament not to give to the full the powers sought, on the ground, chiefly, that they would tend to confer large additional powers on the companies, which powers, in their turn, would have to be the subject of purchase ultimately. After the report of Sir William Harcourt's Committee in 1880, the Metropolitan Board of Works had to consider what course to adopt in regard to the Bills introduced for the raising of further capital; and it was then that the sinking fund legislation, in a somewhat crude and preliminary form, was suggested. There was a great deal of discussion regarding the sinking fund. At first it was rather opposed by the Local Government Board and by the City Corporation. But in the course of the years 1883, 1884, and 1885, witness thought the views both of the Local Government Board and of the Corporation changed; and in 1886—when the Metropolitan Board of Works were in a somewhat peculiar position, owing to the fact that their parliamentary expenses had been disallowed by the Auditor—the Corporation came to the aid of the Metropolitan Board. The matter was again fought out; and what was called a sinking fund clause was for the first time inserted in an Act—viz., that of the East London Water Company. This was a very distinct indication of the view of Parliament—arrived at after considerable discussion—that some steps must be taken with a view to securing a possible purchase of the capital of the London Water Companies. This matter was found to be very complicated. The section, as inserted in the Act of 1886, was in a somewhat crude form. But it had now been discussed in successive Committees of Parliament; and as the clause now stood, and as it had been inserted in succeeding Acts, it was not the same as originally sanctioned. He did not think it necessary, however, to go into the clause as at present drafted, because the alterations made were chiefly in form, and not in principle. Witness went on to point out a number of cases in the Provinces in which, he thought in every case by purchase, the corporations or local authorities were supplying water in their own areas. Among the cases he instanced, were Birmingham, Blackburn, Bolton, Bradford, Cardiff, Glasgow, Halifax, Huddersfield, Leeds, Manchester, Northampton, Oldham, Sheffield, Stockton, and Middlesbrough.

It was agreed by the representatives of the County Council, in response to a suggestion of the Chairman, that particulars regarding the capital, the purchase-money, and whether the purchase price was fixed by arbitration or agreement, &c., in these cases should be furnished to the Commission.

Witness (continuing) said the County Council considered several paragraphs in the reports of Sir M. W. Ridley's and Sir William Harcourt's Committees as of great importance in reference to their policy: and they had fashioned this policy as far as possible in accordance with those paragraphs. Thus Sir William Harcourt's Committee, at the outset, stated that it was expedient that the supply of water to the Metropolis should be placed under the control of some public body, which should represent the interests and command the confidence of the consumers. Then Sir M. W. Ridley's Committee proceeded on the assumption "that in the opinion of Parliament, it is desirable to establish a single popular representative Water Authority for the Metropolis." This latter Committee had before them two Bills—one introduced by the Vestries, and the other by the City of London—and between them they proposed every sort of control except a central municipal body. The representatives of the County Council entered into negotiations, to see if they could not arrive at some agreement; and eventually, by concessions on both sides, they came to an arrangement with the City Corporation which, if not very logical, enabled the bodies to work in harmony on the question—as they had done ever since. The agreement come to was that, while the purchase should be undertaken by the Council, the ownership should be in the hands of the Municipal Authority for London, and the management in the hands of a Committee of both bodies. This proposition was submitted to Sir M. W. Ridley's Committee; and as they would see from their report, purchase by the London County Council was distinctly contemplated and suggested there—and not only purchase but the adjustments which would be necessary between London and the districts which were within the supply of the Metropolitan Companies but outside London. Witness proceeded to deal with the Bill promoted by the Council in 1895 for the compulsory purchase of the concerns. In the course of the parliamentary proceedings in connection with this measure, Lord Rathmore (then Mr. Plunkett) stated that the Committee of which he was Chairman, and which were considering the measure, were clearly of opinion that they should adhere to the paragraph in Sir William Harcourt's report, and proceed on the assumption that, in the opinion of Parliament, it was desirable to establish a single representative Water Authority for the Metropolis. Witness maintained that, although the Bill was not passed owing to the change of Government, the statement indicated a feeling of friendliness and general agreement towards the proposals on the part of the Committee. The Southwark and Vauxhall Water Company introduced a Bill in 1884. The argument against it was that they were seeking large concessions which, having regard to the imminence of purchase, ought not to be granted to them without some controlling provision. Consequently, Parliament only sanctioned the powers sought on the condition that, in the event of purchase within seven years, the Company should not be able to make any claim in respect of advantages conferred by the Act. In other words, the concessions were to be temporary, and were not to be bought back by London if the purchase took place. A similar clause was also inserted in the Staines Reservoirs Act of 1896. From a very long and close connection with all these cases before Parliament for the last 25 years, witness thought he was justified in saying that the policy of Parliament during this period had been distinctly in favour of purchase of water companies by local authorities.

The CHAIRMAN: In your view, there are some special reasons in London, beyond provincial towns, why purchase is desirable?

Witness: Yes; I think there are special circumstances in London which go to show that purchase is really more necessary than in provincial towns.

Can you give us those reasons shortly?—One point which seems to me to be important is that the statutory powers which the London Water Companies have obtained, and which are the foundation of their present charters, were secured at a time when there was no local authority existing competent to protect the interests of the consumers. In the provincial cases, there was always a municipal corporation or local board. In London, until 1888, there was no such authority existing. If there had been, I think the probabilities are that the earlier statutes of the Companies, and the powers they have obtained, would have been very materially altered. There was no local body managing London till 1855, when the Metropolitan Board of Works was established, with

powers of very limited character—especially with regard to water; and the County Council was only established in 1888. The City Corporation were a very important body; but they represented only a hundredth part of the Administrative County of London in area, an eighth of its rateable value, and about a hundred and fortieth part of the residents.

Do you suggest that the City is not identical in its interests with the rest of London?—I think it is obvious that the interests of the City, in reference to the water question, are not only not identical, but are adverse to those of the rest of London, because of the much greater rateable value of premises in the City as compared with the resident population.

I should have thought that London was more anxious for a cheap supply?—The City is keenly interested in having a water supply by meter, in order that consumers may pay for the actual quantity used, and may be relieved from the liability to contribute according to their rateable value. The interests of the rest of London, substantially, is that the existing system of charge (which prevails all over the United Kingdom) should be maintained—that the charge for water should be based upon the rateable value. You will see at once the meaning of this, if you consider these figures—that the City represents an eighth of the rateable value, and a hundred and fortieth part of the resident population of London.

Yes; I see what you mean now. Are there any other special circumstances in London?—The next important consideration is one which I think the Committee will be familiar with. London is supplied by eight different Companies. In all the other large cities and towns where this policy of purchase has been successfully carried through, there has been only one company. This company has had a practical monopoly, and their position has been quite clear and intelligible. In London, the confusion and difficulty resulting from there being eight Companies has always been very considerable. In some of the poorer districts, the areas were so mixed up that the consumers really did not know which Company were supplying them. The competitive position of the London Companies put them in a totally different position from any other company in the kingdom. Originally London was supplied by the New River Company and the Chelsea Company; and these two undertakings had a monopoly. This led to great dissatisfaction; and new Companies were authorized to compete with them. One of these Acts expressly provided that the Company should never dispose of the parliamentary rights conferred upon them; the object being to secure competition in the district. Thus the *raison d'être* of the West Middlesex Water Act of 1810 was to give the Company power to supply in the district of another. In the case of the Lambeth and Vauxhall Companies, one had power to supply in the district of the other.

Do you suggest that Parliament could now, without unfairness to the Companies authorize a fresh supply to the whole of London?—I think it would be hardly reasonable for Parliament to sanction a new competition with the Water Companies until a proposal had been made to purchase them. This offer has been made, and rejected.

Then what does the point come to? If competition is to be put aside as unfair, why do you ask us to consider it?—If what I suggest was the intention of Parliament—as explained in 1806, 1810, 1821, and 1852—had been carried out, the rates at the present moment charged to the consumers in London must have been very much less than they are. Competition, I think, was sanctioned by Parliament with the object of improving the supply and bringing down the charges of the older Companies; and the system has failed, in my opinion, by reason of combinations among the Companies themselves—which combinations were outside their statutory powers, and in contravention of Act of Parliament.

Is it not the case that the Companies are now relieved from the obligation to supply a district which is at present served by another Company?—The position is this: The Companies certainly are not relieved in the sense of excluding them from the areas of supply of another Company. Under the Water-Works Clauses Act of 1847, every company empowered to supply water by statute in a given area can be compelled to serve that area on the requisition of consumers, subject only to certain terms and conditions.

Witness (continuing) said that at the conclusion of the inquiry in 1852, some words were inserted in the Water Companies Act which prevented consumers from compelling any one Company to furnish water in an area supplied by another; the object being to prevent absurd and unnatural applications. A portion of the district south of the Thames was in the area of supply of both the West Middlesex and the Vauxhall Companies. The West Middlesex rate was less, roughly speaking, by 25 per cent. than that which the Vauxhall Company were actually charging. The consumers were, however, by the words inserted in the Act of 1852, deprived of the power of calling upon the West Middlesex Company. Yet this did not take away from either Company the conditions on which their undertakings were authorized. If the West Middlesex Company were to supply the district, the consumer would get better water at 25 per cent. less cost. This was a most amazing state of things. It was a fact which seemed to render purchase in London more essential and expedient even than in those provincial cases where purchase had been authorized. From time to time, these two Companies had introduced Bills for combination or amalgamation. But they had always been opposed; and, he believed in consequence of the express enactment of 1810, Parliament had never allowed them to get rid of their moral obligations to supply water throughout their whole area. Another reason for purchase, special to London, lay in the way in which the rateable value of premises had outgrown that at the time when the rates and charges were fixed, in 1852. Certain instances were on record; and from these it appeared that rates which were arranged in 1852 for water supply, and were calculated to bring in £296 per annum, now produced in respect of the same property £740. In 1852, after two sessions of inquiry, the Government had a Bill before Parliament one effect of which would have been to considerably reduce the rates chargeable by the Companies. There were also a number of Companies' Bills before Parliament; and it became a question whether the Companies' or the Government Bill should pass. The Companies then stated expressly that the rates would be kept down by competition; and that it was not intended to charge at the maximums placed in the Bills. It was on this understanding that the Government Bill was rejected, and the Companies obtained the Acts on which they now relied, and made their maximum charges. He could not say that they always charged at the maximum rate; but he had made a point of seeing many demand notes, and never found one in which the rate was less than the maximum. A few large consumers were charged at a lower rate. At one place also, where the Lambeth and Vauxhall Companies were still in competition—he spoke subject to correction—the result was that the rates had been reduced; so that where the competition had prevailed, the effect had been what was intended by Parliament. At Croydon, too, the Lambeth Company supplied premises very near the Croydon limits; and there the Company had again been obliged to reduce their rates from what they were charging elsewhere to something like the equivalent of the Croydon Corporation charge. Another special point was that originally, while most of the towns in England derived their supply from the rivers that ran through them, others had had to incur large expenditure in procuring water from distant sources. If therefore they compared the charges in the Provinces with those in London, they were comparing a charge for a supply which had involved a large expenditure with one which was merely for distributing the water of the Lea and Thames. The London rate was about the same as in the Provinces; whereas, having regard to the advantage London enjoyed in not having to undertake large expenditure to procure supplies, he held that it should be less. One thing which did not exist out of London, he believed, was the departmental control which was exercised over the Companies. For instance, the accounts had to be audited by an Auditor who was paid by the Companies. The Auditor, however, occupied a curious position, for his power of enforcing his decisions was limited by the obligation on his part to pay the cost of any legal proceedings out of his own pocket. Another peculiarity in London was that, almost alone among great communities, there was a large area where people had no means of getting a water supply to the top of their houses. Then the Committee were aware there had been great deficiencies in the supply—sometimes when it was hot, and at others when it was cold. This was a matter in controversy between the Engineer of the Council and the Companies; and he would therefore leave it. The rates, as the Committee might see from a table he handed in, varied, and appeared to be greater in the poor districts than in the rich. The East London Company had argued that their district was poor; that it was not so profitable to supply in a poor district as in a rich one; and that therefore they must be allowed to charge more. This was all very well from the Company's point of view; but is seemed fair to say that, if any difference was to be made, the rich districts ought to pay more. The West Middlesex Company's rates were at present lower than those of any other Company; and this was no doubt due to the fact that they were supplying an area where the rateable values were high, and where there was not much small property. They had also cleared off their back dividends, and were paying their maximum interest; and thus they could only get rid of their surplus by reducing the charges. There was a great deal of doubt as to the meaning of "domestic purposes;" and witness thought it very likely there were charges levied as extras, which really ought to be included in the general rate. He agreed, however, that this was a legal matter. Witness put in some further tables, showing that the net profits of the Companies available for dividend in 1895 were £838,000 odd, and that the sum actually divided was £913,000; the difference being accounted for by the fact that Companies carried forward at the end of the year a smaller balance than they brought from the previous one. The net profits in 1896 were £952,000, so that the Commission were dealing with an income which, possibly for exceptional reasons, varied as largely as from £838,000 to £952,000 in two successive years. The ordinary capital of the Companies, it appeared, totalled £10,288,410.

The CHAIRMAN: What is the market value of that?

Witness: It is a thing which varies considerably. I cannot tell you.

Are the payments to the sinking fund correct, according to the Acts of Parliament? They seem extremely small?—They are small.

Are they right according to the Act?—Yes; the clause has not begun to operate yet.

Witness pointed out, as further showing the policy of Parliament, that in 1894 it was provided, for the first time, that additional capital required by the Companies should be raised by the issue of stock redeemable in 25 years. It was contended at this time that the stock could not be issued most favourably in that way; but the decision was adhered to, because it was felt that otherwise there would be difficulty about the stock if the Companies were bought up. One effect of the purchase of the Companies would be that a very large sum spent annually by the Council and the Companies in parliamentary proceedings would be saved. Witness thought it would be the opinion of the members of the County Council that the terms of arbitration should be clearly settled before embarking on a scheme of purchase. In case of purchase, there would be a claim for back dividends, except in the case of the West Middlesex Company. The Kent and Chelsea Companies were paying off theirs; but the probability of the other Companies ever arriving at this stage was so remote as not to be worth consideration. Questioned as to whether there was not a report of the Water Committee of the Council, in which it was stated that the purchase of the Companies, at a cost of £30,000,000, would have the effect of increasing the present water-rates by at least 30 per cent., witness said the Chairman of the Committee would be better able to answer that question. The effect of the sinking fund clause had been very important, because it had permanently arrested the development of the capital of the Companies. A very large sum had been authorized within the last few years; and when the sinking fund clause operated in respect of the capital, it would at once begin to assume importance.

The Commission then adjourned till Dec. 6; witness's examination-in-chief not having concluded.

The Gas and Water Works Purchase Question at Bridgend.—In noticing last week the proceedings at a meeting of ratepayers of Bridgend called to consider a proposal to acquire the gas and water works, we minimized the strength of the opposition to the scheme by stating, on the authority of a local paper, that the resolution submitted was defeated by 30 votes to 19. We now learn that the actual figures were: For the purchase, 18; against it, 131. It will be remembered that a poll was demanded, and fixed to take place on the 11th prox.; but it was subsequently withdrawn—the feeling of the town being so strong against the District Council having control of the undertaking.

NEW GAS-WORKS FOR COVENTRY.

At the Meeting of the Coventry City Council last Tuesday, the Gas Committee reported that they had been engaged upon inquiries with a view to securing a site for auxiliary gas-works, which were rendered necessary by the recent great increase in the consumption of gas. A suitable site was available in the parish of Foleshill; and the Committee had ascertained that about 38 acres of land, with access to the railway, canal, and road, could be purchased in this position. In the opinion of the Committee, it was desirable to buy this site, and to obtain powers to erect auxiliary works thereon as occasion arose. For this purpose it would be necessary to obtain parliamentary powers for the acquisition of borrowing powers and so forth. In the judgment of the Committee, it was also desirable to take the opportunity afforded by this application to Parliament to obtain amendments to the existing Acts relating to the gas undertaking which had been found in working to be necessary. The Committee accordingly recommended that they be authorized to give the requisite notices, and take all other steps to enable the Council to make application to Parliament next session.

Alderman ANDREWS, in moving the adoption of the report, said the Corporation bought the present gas undertaking fourteen years ago at a cost of £170,000; but, the capital of the old Gas Company being all expended, they had immediately to find money for the enlargement of the works, and for trading purposes, so that at the end of the first year—Dec. 31, 1885—the capital stood at £193,470. The policy which had since been adopted by the Committee might be put under four heads. In the first place, their policy had been to keep down the capital account; and during the fourteen years they had charged everything that could be fairly so charged to revenue instead of drawing on the capital. The result was that at the present day the capital stood at £218,800—a difference of only £25,000 in thirteen years. Out of this £25,000, mains had been recently laid in all new streets; and between £8000 and £10,000 had been lately expended on water-gas plant. Considerable properties had also been purchased adjoining the present works; so that, in spite of the fact that the business had nearly trebled in the time the Committee had managed it, the expenditure of capital had been very small indeed. Now, their borrowing powers had run out; and they had to apply to Parliament for further money. In the second place, the policy of the Gas Committee had been, for the benefit of the manufactures and trades of the city, to gradually reduce the price of gas to something like what it was in neighbouring towns. The consumption of gas in Coventry was more dependent on the manufactures than probably in any other town or city in the kingdom. Last year there were firms who paid £1000 for gas alone, and some who paid even more than that. The price had been lowered from 3s. to 2s. 4d. per 1000 cubic feet; but at the same time the ratepayers had not been forgotten. The third point was that, having lowered the price and provided an annual surplus for the benefit of the ratepayers, the Committee some years ago came to the conclusion that 6d. in the pound on the rate was a fair amount for the consumers to provide, and a fair sum for the ratepayers to be satisfied with. The result had been that in the last ten years an additional £24,000 had been provided for the relief of the district rate. His fourth point was that, having provided an amount equal to 6d. in the pound from the surplus profits, any further profit should go to increase the sinking fund to repay capital. Under this head £4000 had been added to the sinking fund during the last three years; and it now amounted to about £20,000. Under the new Bill there was every probability that Parliament would insert a clause limiting the amount of profit to be taken from the consumers for the benefit of the rates; and in all likelihood they would obtain only 40 years or less in which to redeem the capital. Last year, owing to the boom in the cycle trade, they had an increase of 24 per cent. in the consumption of gas; and in order to cope with this, the Council sanctioned the erection of a water-gas plant. This was not ready till February; and, consequently, during the winter months they had to rely entirely on the coal-gas plant, and the works were taxed to the utmost point. The capabilities of the present works in the production of coal gas amounted to 2¾ million cubic feet per day; and the quantity of water gas that could be manufactured was 1¼ million cubic feet—making 4 millions in all. The reason why it was proposed to build auxiliary works was that, in the first place, it was not their intention to increase the proportion of water gas beyond about 30 per cent.; and they wanted further plant capable of manufacturing coal gas. In the second place, they must have some reserve; and, thirdly, the auxiliary works would take two years to build. The Gas Committee had no intention whatever of bringing forward any scheme for the removal of the present works. The cost of the auxiliary works was estimated to be about £100,000 for the production of a million cubic feet of gas per day. That was to say, the present capital of £200,000 would be increased 50 per cent., from £200,000 to £300,000; but the production of gas would only be increased by 25 per cent., from 4 million to 5 million cubic feet per day. If it were proposed to remove the present works to another site, this would entail an additional expenditure of £100,000 or £150,000; and the capital of the concern would then approach half a million.

Mr. DRINKWATER seconded the motion, which, after a short discussion, was adopted.

ELECTRIC LIGHTING NOTES.

Owing to the failure of the electric light in the Queen's Bench Division and in the corridors and offices of the Law Courts on Monday last week, candles were brought into use; the gas supply having been cut off.

Lieut.-Col. Albert C. Smith, R.E., one of the Local Government Board Inspectors, held an inquiry last week at the Croydon Town Hall, respecting the application of the Council to borrow £13,450 for street widening and an extension of the electric lighting works.

The Buxton District Council have decided, by six votes to two, to construct works for electric lighting. It is considered by some of the ratepayers very doubtful whether, in a town of the character of Buxton, the undertaking will be a financial success. But the majority of the Council

GAS AND WATER COMPANIES' STOCK AND SHARE LIST

Referred to on p. 1162.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 14	10½	Alliance & Dublin 10 p. c.	23½—24½	..	4 5 9
100,000	10	„	7½	Do. 7 p. c.	16½—17½	..	4 5 8
300,000	100	July 1	5	Australian 5 p. c. Db.	106—108	..	4 12 8
200,000	5	Nov. 11	6½	Bombay, Ltd.	6½—7	..	4 12 10
40,000	5	„	6½	Do. New, £4 paid	5—5⅝	..	4 14 6
380,000	Stk.	Aug. 27	12	Brentford Consolidated	300—305	..	3 18 8
240,000	„	„	9	Do. New	227—232	..	3 17 7
50,000	„	„	5	Do. 5 p. c. Prf.	145—150	..	3 6 8
159,375	„	June 11	4	Do. 4 p. c. Db. Stk.	135—139	..	2 17 6
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig.	273—278	..	4 2 8
208,820	„	„	8½	Do. A. Ord. Stk.	200—205	..	4 2 11
933,500	Stk.	Aug. 27	5	Bristol, 5 p. c. max.	130—135	..	3 14 1
420,000	20	Sep. 30	11½	British	56—57	..	3 18 11
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
71,000	10	„	8½	Do. 7 p. c.	20—22	..	3 17 3
500,000	10	Oct. 14	6	Buenos Ayres (New) Ltd	9½—10½	..	5 14 3
98,122	Stk.	—	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	July 15	8½	Cagliari, Ltd.	30—32	..	5 3 1
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	16½—17½	..	4 11 8
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	59—61	..	4 18 5
550,000	Stk.	Oct 14	13½	Commercial Old Stock	340—345	..	3 18 3
196,483	„	„	10½	Do. New do.	255—260	..	4 0 9
196,309	„	June 11	4½	Do. 4½ p. c. 1 b. do.	155—158	..	2 16 11
80,000	Stk.	June 11	12†	Continental Union, Ltd.	257—262	..	4 11 7
200,000	„	„	9†	Do. 7 p. c. Prf.	218—223	..	4 0 8
51,600	Stk	Aug. 27	14	Croydon A 10 p. c.	315—320	..	4 7 6
163,400	„	„	11	Do. B 7 p. c.	252—257	..	4 5 7
535,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	138—142	+1½	3 18 11
60,000	„	„	5	Do. 5 p. c. Prf.	140—143	..	3 9 11
486,090	10	July 29	11	European, Ltd.	25½—26½	..	4 3 0
354,060	10	„	11	Do. £7 10s. paid	18—19	..	4 6 11
5,896,590	Stk.	Aug. 12	12½	Gaslight & Coke, A, Ord.	315—318	+5	4 0 2
100,000	„	„	4	Do. B, 4 p. c max.	113—118	..	3 7 10
665,000	„	„	10	Do. C, D, E, 10 p. c. Prf.	317—322	..	3 2 2
30,000	„	„	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	„	„	7½	Do. G, 7½ p. c. do.	222—227	..	3 6 1
1,300,000	„	„	7	Do. H, 7 p. c. max.	203—208	..	3 7 4
463,000	„	„	10	Do. J, 10 p. c. Prf.	317—322	..	3 2 2
476,000	„	„	6	Do. K, 6 p. c. Prf.	182—187	..	3 4 2
1,061,150	„	June 11	4	Do. 4 p. c. Db. Stk.	139—142	..	2 16 4
294,850	„	„	4½	Do. 4½ p. c. do.	156—159	..	2 16 7
908,000	„	„	6	Do. 6 p. c. do.	207—212	..	2 16 7
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	Nov. 11	10	Imperial Continental	213—218	+1	4 11 8
376,400	100	Aug. 3	4	Do. 4 p. c. Dbs. Red.	99—102	..	3 18 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk.	104—107	..	3 5 5
75,000	5	June 29	6	Malta & Medn., Ltd.	5½—6	..	5 0 0
560,000	100	Oct. 1	5	Met. of Melbourne	5 p. c. Db. 4½ p. c. Db.	112—114	+1	4 7 8
250,000	100	„	4½			107—109	..	4 2 7
541,920	20	Nov. 11	5	Monte Video, Ltd.		14½—15½	..	6 9 0
150,000	5	Nov. 26	8	Oriental, Ltd.		8—8⅛*	..	4 14 1
135,000	5	„	8	Do. New, £4 10s. pd.		7—7⅛*	..	4 16 0
15,000	5	„	8	Do. do. 1879, £1 pd.		1—2*	+¼	4 0 0
60,000	5	Sep. 30	7	Ottoman, Ltd.		4½—5	..	7 0 0
420,000	100	Nov. 2	6	People's Gas 1st M. Bd. of Chicago 2nd do.		104—109	..	5 10 1
500,000	100	June 1	6			105—110	..	5 9 1
250,000	10	Sep. 30	10	San Paulo, Ltd.		16—17	−½	5 17 3
135,000	Stk.	—	10	Sheffield A.		250—253	..	3 19 0
209,053	„	—	10	Do. B.		250—253	..	3 19 0
447,4.7	„	—	10	Do. C.		250—253	..	3 19 0
5,475,000	Stk.	Aug. 12	5½	South Metrop., 4 p.c Ord		144—147	..	3 11 5
1,416,667	„	July 15	3	Do. 3 p. c. Db. Stk.		106—109	..	2 15 0
60,000	Stk.	Sep. 15	1½	Tottenham and Edmonton A. B.		280—290	..	4 2 9
60,000	„	„	9			205—215	..	4 3 9
182,380	10	May 27	8	Tuscan, Ltd.		13¾—14½	..	5 10 1
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.		102—105	..	4 15 3
				WATER COMPANIES.			
746,159	Stk.	June 29	10½	Chelsea, Ord.		337—342	..	3 1 5
150,000	„	„	5	Do. 5 p. c. Prf.		177—180	..	2 15 6
160,000	„	„	4½	Do. 4½ p.c. 1 f. Stk., 1875		157—160	..	2 16 3
175,785	„	Sep. 30	4½	Do. 4½ p. c. 1 b. Stk.		160—165	..	2 14 6
1,720,560	Stk.	Oct. 14	7½	East London, Ord.		232—236	..	3 3 8
654,740	„	June 29	4½	Do. 4½ p. c. Db. Stk.		163—166	..	2 14 3
390,000	„	„	3	Do. 3 p. c. Db. Stk.		106½—107½	..	2 15 10
700,000	50	June 11	7½	G'd Junct'n, 10 p. c. max.		123—128	..	2 18 6
295,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.		147—152	..	2 12 8
708,000	Stk.	Aug. 12	13	Kent		362—367	+2	3 10 10
160,000	„	„	7	Do. New, 7 p. c. max.		215—220	..	3 3 7
1,043,800	100	June 29	10†	Lambeth, 10 p. c. max.		305—310	+2	3 4 6
406,200	100	„	7½	Do. 7½ p. c. max.		227—232	..	3 4 8
350,000	Stk.	Sept. 30	4	Do. 4 p. c. Db. Stk.		147—150	..	2 13 4
500,000	100	Aug. 12	13	New River, New Shares		450—455	+2	2 17 1
1,000,000	Stk.	July 29	4	Do. 4 p. c. Db. Stk.		152—155	..	2 11 7
902,300	Stk.	June 29	5	Southw'k & V'xhall, Ord.		163—166	..	3 0 2
126,500	100	„	5	Do. do. 7½ p. c. max.		151—154	..	3 4 11
489,200	Stk.	„	5	Do. do. 5 p. c. Prf.		175—180	+2	2 15 6
1,019,585	„	Oct. 14	4	Do. 4 p. c. A Db. Stk.		144—147	..	2 14 7
1,155,066	Stk.	June 11	10	West Middlesex		320—325	..	3 1 6
200,000	„	„	4½	Do. 4½ p. c. Db. Stk.		163—166	..	2 14 3

* Ex div. † Next dividend will be at this rate.

back up their position by pointing out that a Company are prepared to spend £15,000 on works for the district; and therefore, they argue, if the Company could profitably do this, there is no reason why the Council should not. But who knows that the Company could?

A special meeting of the Huyton District Council was held last Tuesday to discuss the question of adopting electric lighting. It was reported that the British Insulated Wire Company were willing to supply electricity to the district at the maximum rate of 6d. per unit, and to wire the public lamps free of charge. In a further communication, the Company had consented to take off 33 per cent.; thus reducing the charge to 4d. per unit. They had also agreed that the Council should have power to purchase the undertaking at any time after fourteen years at a price to be settled by arbitration. The offer was accepted.

At the last meeting of the Hastings Town Council, the Lighting Committee reported that they had authorized the Town Clerk to give the requisite parliamentary notice of the intention of the Corporation to apply to the Board of Trade for a Provisional Order, in pursuance with a contract entered into with the Electric Light Company for the purchase of their undertaking. Some of the members protested against this action. But the Town Clerk pointed out that the provisional contract had been entered into; and it was possible that the Council might become involved in legal proceedings if they withdrew. This looks as though the Council are not now altogether satisfied with their position in the bargain.

At the meeting of the Weymouth District Council on the 18th inst., the subject of the electric lighting of the town was brought forward on a report presented by the Electric Lighting Committee, in which they recommended as follows: "That the Corporation retain in their own hands the supply of electricity for public and private purposes within the borough; and that the services of Messrs. Bramwell and Harris be retained to assist the Borough Surveyor in preparing and getting out the necessary plans, designs, and schemes that may be required to support the application to the Board of Trade for a Provisional Order for powers to supply electricity." After discussion, the report was adopted.

The Shrewsbury Town Council yesterday week resolved to apply for a Provisional Order to authorize them to supply electricity for public and private purposes in the borough. The Council have agreed to purchase the undertaking of the local Electric Lighting Company for £21,500; but the latter are now seeking to impose additional terms. They wish the Corporation to pay a commission of 10 per cent. on all liabilities incurred from Jan. 1 last until the completion of the purchase, or a sum not exceeding £500 as a fund to meet current expenses—such as official salaries, engineers' fees, and legal and other charges. Further, that in the event of the Corporation not becoming purchasers of the undertaking, and the outlay having been incurred by the Company to provide for street lighting or the lighting of public buildings, the Corporation should take current from the Company in full value equal to the payment of 10 per cent. on such outlay. The Council naturally object to the Company trying to make fresh terms after entering into an agreement; and the proposals have been rejected.

The Engineer's report on the proposed extension of the St. Pancras electric lighting mains to the Hampstead boundaries of the parish was considered by the Vestry last Wednesday, having been adjourned from the previous meeting. Mr. Menzies, the Chairman of the Committee, moved—"That the scheme, as sanctioned by the Vestry in November, 1894, be and is hereby rescinded; and that, in place thereof, the scheme as now recommended be approved and adopted by the Vestry." The former scheme, prepared by Professor Robinson, did not include street lighting; while the latter, as pointed out in a recent number of the "JOURNAL," does. From this source alone the revenue is estimated at "about £1000 per annum"—that is to say, the ratepayers must pay this sum for their street lighting, whether they like it or not; and the income of the electric lighting undertaking will benefit accordingly. As Dr. Smith, in opposing the motion, pointed out, only two applications for private lighting had been made—one for four lamps and the other for nine. But the scheme provides for 750 16-candle lamps. He moved, as an amendment, that the matter be referred back. Mr. Dixon, in seconding the motion, urged the Vestry not to extend the indebtedness of the parish any further unless they wanted a warning from the Local Government Board. The ratepayers would, he said, have to pay £1000 a year for 30 arc lamps. These arguments had little effect on the members, only 10 supporting the amendment, which was lost by a majority of 40. The Engineer reports that "the carrying of this extension into effect will not be a very long job;" but it will cost the ratepayers £5422. As the debate continued till a late hour, the question of "lightening the cost of supply to consumers using current for long hours each day" was adjourned till the next meeting.

The electric shock which Charles Thorpe received at Dublin on the 30th ult., under circumstances reported in our issue for the 9th inst., has resulted in litigation. Thorpe seeks damages against the Corporation for the injuries which he sustained, through, as he alleges, the neglect of the defendants. On behalf of the latter, an application was made yesterday week by Mr. Macinerney, Q.C., in the Queen's Bench Division of the High Court of Justice, Ireland, that all further proceedings in the action should be stayed, or that it be remitted for trial before the Recorder of Dublin at the next Civil Bill Sessions. Counsel stated the cause of action, and read an affidavit by the Town Clerk, who said the Corporation had a good and valid defence on its merits, and that the plaintiff had no visible means of paying costs should a verdict not be found for him. Among other affidavits was one by the Manager of the central electric lighting station (Mr. Mark Ruddell), who asserted that plaintiff called at the station on the night of the 30th ult., and stated that he had been thrown down by an electric shock at the corner of Grafton Street. His clothes were muddy; and he asked for compensation. In Mr. Ruddell's opinion, plaintiff was not at all injured. Other affidavits by medical gentlemen declared their conviction there was nothing wrong with plaintiff, and that he was at present in perfect health, even if he did receive a shock as described. On the other hand, Mr. O'Shaughnessy, Q.C., submitted that his client had received severe injuries; and he relied on an affidavit of Dr. Fagan. He contended that this was not a cause of action that should be sent to the Recorder's Court, and that the motion was wholly untenable. Justices Murphy and Gibson, however, remitted the action for trial before the Recorder, and expressed the opinion that the latter would award the plaintiff compensation for any injury he might have received.

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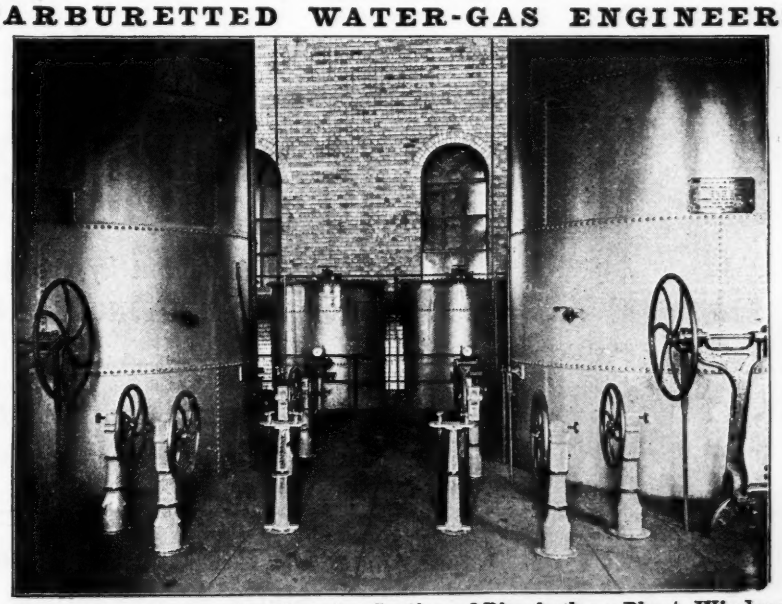

RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

PORTSMOUTH WATER SUPPLY.

Half-Yearly Meeting of the Water Company.

In view of what has lately appeared in the "JOURNAL" on the subject of the water supply of Portsmouth, more than ordinary interest attaches to the half-yearly report of the Portsmouth Water Company, which was presented to the shareholders at the ordinary general meeting last Thursday. Taking the portion of the document relating to the general position of the Company, we find that the balance on the profit and loss account is £20,295, out of which the Directors recommended the payment of the full statutory dividends. This, after the usual deductions for void houses, &c., would leave a balance of about £5675 to be carried forward. During the half year ending the 30th of September, 3402 yards of additional street service mains were laid in new roads; making a total of upwards of 45 miles of trunk mains and 120 miles of service mains. The number of additional services connected with the mains in the six months was 475; making the total number of premises now under supply by the Company in all the districts 37,535. The quantity of water pumped from Havant and Bedhampton was 1,355,354,000 gallons, or an average supply for all purposes of 7,447,000 gallons per diem; being a daily increase of 477,000 gallons over the corresponding period of last year. The quantity supplied is equal to an average for domestic purposes of 30 gallons daily per head of the population, exclusive of all supplies by meter. The number of fire hydrants now fixed is 2967. The Engineers reported that the works and plant were in good order, and that the springs continued to yield the usual abundant supply. The Directors dealt with the criticisms which have lately been offered in regard to the Company's water. A short time ago, Dr. Theodore Thomson, acting on behalf of the Local Government Board, furnished the latter with a report upon the conditions—topographical, geological, and sanitary—of the Havant districts (urban and rural), in their relation with the sources of the Company's water supply. Thereupon, communications between the Town Council of Portsmouth and the Directors upon the subject took place. The Directors fully realize the extreme gravity and importance of the subject, which is engaging their most earnest attention; but while far from wishing to minimize the desirability, and even necessity, of further reasonable precautions tending to secure the purity of the Company's sources of supply, they feel that they are justified in pointing to the fact that the numerous and frequent reports and analyses of the water conclusively prove that no contamination such as that which is dreaded has hitherto taken place, and that the water ranks very high as a water of exceptional purity. They added that during the last fifteen years no less a sum than £50,000 had been expended in the acquisition of properties and in the execution of works having for their sole object the protection of the Company's sources of supply; thus proving the solicitous attention which this vitally important object has received, at a very heavy cost to the Company. It has always been the practice of the Directors, from time to time, to cause an analysis of the water to be made by some eminent chemist, in order to be assured of its continued purity. In a report from Professor W. H. Corfield, M.A., M.D. (Oxon.), F.R.C.P., London, Professor of Hygiene, &c., dated the 4th of May last, he speaks of it in the following terms: "The three samples of water submitted to me are all good clear samples, with the usual characteristics of water from chalk springs. They are all quite free from organic impurity, and, in fact, are waters of exceptional purity; and they are all of the same excellent quality." In the report of the Drainage and Sanitary Committee of Portsmouth, dated the 20th of October last, it is stated that, "up to the present, no analysis of the water supplied to the town has ever shown any trace of contamination; on the contrary, the analyses have always shown it to be of the purest and most excellent character." The Chairman of the Company (Mr. W. Grant, J.P.), in moving the adoption of the Directors' report, dealt at considerable length with their policy and proposals. He said they were, and always had been, deeply conscious of the vast responsibility resting upon them in connection with the health of the inhabitants of the borough. The Portsmouth water must, like Cæsar's wife, be "above suspicion," if any reasonable expenditure on the Company's part could make it so. It would be their bounden duty, by the light of Dr. Thomson's report, to redouble their vigilance and their efforts, and thus to secure to the people of Portsmouth in the future the great blessing which he (the Chairman), with absolute fearlessness and all the emphasis he could command, declared they had enjoyed in the past—an unstinted supply of one of the most beautiful waters to be found in the United Kingdom. Since the issue of Dr. Thomson's report, they had taken steps, by purchasing certain houses, and entering into negotiations for acquiring other property, to protect the Havant Springs; and they purposed obtaining the advice of some very eminent scientific expert as to the course they ought to follow in view of the report. In any event, expenditure would have to be incurred; and therefore they had decided on applying for a Provisional Order to sanction a fresh issue of £45,000 of share capital, with the usual borrowing powers. The Deputy-Chairman (Colonel C. Lanyon Owen) seconded the motion, and it was carried unanimously.

An Extensive Village Water Scheme.—An important scheme of water-works designed to supply at least a dozen villages in the Evesham and Pebworth districts has been completed. It was undertaken by the Evesham Rural Sanitary Authority, in accordance with plans prepared by Mr. J. E. Wilcox, of Birmingham; and it provides a supply of water for a population at present numbering 3148. The fact that the area of the parishes supplied is nearly 24 square miles, and the length of the trunk mains and branches about 30 miles, gives an idea of the magnitude of the work. The water is obtained from springs issuing in the Cotswold Hills, and is of an exceptionally pure character. The works have been executed by Mr. T. Vale, of Stourport, whose contract price was £6190; and the pipes required were supplied by Messrs. Roberts, of West Bromwich, whose tender amounted to £6062. The works were opened last Thursday by the Earl of Coventry, who was presented with a handsome silver key by Mr. Wilcox and the Contractors.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There is no longer any ground for entertaining the expectation that the Corporation of Stirling will acquire the undertaking of the Stirling Gas-light Company. The recent municipal election has placed in power the party who opposed the transfer; and while they are in office, there is no prospect of overtures coming from their side. But even if there were, it is now put beyond possibility either that overtures from the Corporation should be entertained, or that any encouragement should be given by the Company to the submission of an offer to negotiate; for the Company have issued notice of their intention to apply to Parliament for an incorporating Act. Of course, the Bill will pass; and its effect will be to establish the Company so firmly that the Corporation will not be able to buy them out. I doubt not but that the time will come when those who have been the means of frustrating the proposed transfer may come to entertain the wish that they had not been so successful. It is certain that the transfer, at the price which was proposed, would have been a profitable transaction for Stirling; and when the community awaken to the fact of their loss, those who were responsible for it will be hounded from public life. The Corporation cannot oppose the Bill, except to the extent of asking terms, which I suppose they will do. It may almost be taken as a matter of course—though I perceive that the Company do not propose it—that Parliament will introduce the sliding-scale for the regulation of price and dividend. To this extent, therefore, the opposition of the Corporation will be unnecessary, because Parliament will be able to fix the figures. There is practically only one point on which the Corporation will have anything to say, and that is as to the power to be given to the Company for opening up the streets. The Company must have authority to do this; but, of course, way-leave may be imposed. In some places this is done by supplying gas for public lighting at a reduced rate, which is an easy way of paying, and one that may be adopted here. I observe that it is proposed to retain the name "The Stirling Gas-light Company." I would advise that the "light" be dropped; for, as a matter of fact, the Company is not to be one for furnishing light alone, there being provisions in the Bill for the supply of gas for all ordinary, or possible, purposes, and for the manufacture of residuals as well. The gas-works are to be retained on the present site. The proposed area of supply is a very wide one—extending from the foot of the Abbey Craig on the north to Bannockburn on the south.

Last Monday night, Professor Ivison Macadam gave an address to the members of the Royal Scottish Society of Arts in Edinburgh on "Carburetted Water Gas." The lecture was an old friend; being the one which he delivered to the North of Ireland Association of Gas Managers at Omagh last August, with some portions left out and others added. In one new passage he stated that a rabbit which was placed in a vessel containing 2 per cent. of carbonic oxide and 98 per cent. of air, at the end of 10 minutes began to be paralyzed, and passed into a somewhat comatose condition, in which it remained for 45 minutes; and then, when fresh air was pumped in, it revived. With 4 per cent. of oxide and 96 per cent. of air, the animal was dead in 4 minutes. With a 5 per cent. mixture in coal gas, one died in 30 minutes; but a less proportion produced no effect whatever. Edinburgh coal gas, he said, contained 10 per cent. of carbonic oxide, and was therefore extremely poisonous. It was as poisonous as prussic acid would be, or nearly so; and a small increase in the proportion would certainly not make it more fatal. In the discussion which followed, one gentleman asked if the calorific value of carburetted water gas differed from that of coal gas. He thought the heat value of carburetted water gas would be much less, and more gas would be required to get the same power. At present, gas-engines were constructed to admit seven or eight volumes of air to one of gas; and it was therefore plain that they would have to alter the admission-valves of their engines, because producer gas had only about one-fourth of the calorific value of coal gas. Owners of gas-engines would have either to make alterations in them, or be content with less power. Another speaker said it was the heavy hydrocarbons which gave trouble in gas engines; and he observed that it was only by largely carburetting water gas that they obtained illuminating power. Mr. H. O'Connor, of Messrs. James Milne and Son, Limited, said that, while Professor Macadam was speaking, he had been calculating the difference which there was likely to be between the carburetted water gas as it was to be distributed in Edinburgh and the coal gas as at present manufactured. He found that the increase in carbonic oxide would be from 9·8 to 13 per cent. He understood that the Gas Commissioners intended to send out 15 per cent. of carburetted water gas in 85 per cent. of coal gas; so that the 30 per cent. of carbonic oxide which one speaker had spoken of, was not likely to be sent out in Edinburgh by the plant recently erected. When he was in London, he erected plant capable of making 4 million cubic feet of carburetted water gas per day—an addition to plant of 2 million cubic feet capacity. It had been sending out gas, in conjunction with coal gas, for six or seven years; and he was not aware that there had been any more trouble from escapes in London during that time than there was before. The gas travelled for 12 or 15 miles, and was then stored in holders and ultimately distributed. The total loss of illuminating power was found to be no greater than it was with the coal gas previously—that was to say, only 1 candle. Professor Bailey thought that, while gas of 16 or 17 candle power might travel any distance, gas of 25 candles could not do so. Then a gentleman whose ideas of gas supply are in a very elementary stage asked why gas should cost so much in Edinburgh when it could be supplied at Wigan for 1s. 6d. per 1000 cubic feet. He, however, mentioned the interesting fact that the late Mr. John M'Crae, of Dundee, tested gas for its heating power, and found that by using 26½-candle gas he required to use 10½ cubic feet to produce a certain result; but that with gas of 15½-candle power he had to use 14½ cubic feet. The conclusion he came to was that it would be in the interests of the community that a lower quality of gas should be introduced—which was again talking without knowledge. Professor Macadam, in his reply, said that the calorific value of carburetted water gas had been calculated to be about one-fifth less than that of ordinary coal gas. Practically, the gas to be supplied in Edinburgh would be no less powerful as a heating agent

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than the present coal gas. The calorific value of the gas was not due to the presence of hydrocarbons, but was much more owing to the hydrogen which was present. An attempt had been made to induce the people of Edinburgh to believe that they were going to receive a supply of carburetted water gas alone; but this was not the case. The fact was that only a small proportion was to be introduced. It was not fair to educate the people to the idea that the gas they were to have was to be carburetted water gas alone. As to the carrying power of the gas there could be no doubt, because in Belfast, where the process had been working for a considerable time, there had been no trouble from condensation. Anyone who had seen the system working would have no doubt whatever as to the best process for the manufacture of oil gas. The good point of water gas was not only the small area required for its production, but the rapidity with which it could be made, and the ease with which an extra quantity of oil could be introduced, if they wanted to increase the proportion. As to the price of gas at Wigan, he could himself make gas of 18 candle power and sell it for 1s. 6d. per 1000 cubic feet, if he were allowed to build his works on the top of the coal pits, and if he had the opportunity of selling his coke and tar to the best advantage. The waste product—gas—would then be of less value to him. Professor Macadam was thanked for his lecture, which, along with the discussion, will have a tendency to dispel some of the misapprehensions which have been circulated as to carburetted water gas.

A fresh objection to the planting of the new Edinburgh and Leith Gas-Works at Granton has just been aired by a writer in the "Scotsman." This gentleman resides to the east of the site; and he has discovered that the prevailing winds in the district are from the west. He is of opinion that the fumes from the works, which will be carried by these westerly breezes, will spoil the west-end of Leith. I have always been of opinion that Edinburgh is distinguished for its east winds. But, apart from this, the works are to be about a mile to the west of Granton in an open country; and I make bold to say that any fumes which may escape will scarcely be felt so far as Granton—not to speak of the district farther east. Besides, the country to the west of Granton is already occupied by a chemical works; and it is an advantage to get a site for a gas-works in such a district, before it becomes a residential one.

There is a nervousness among Dundee public men with reference to the expenditure of money which ill befits the representatives of so active and enterprising a commercial community. The reason may be found in the fact that both the gas and the water undertakings of the city were acquired at greater cost than the experience of other places warrants, or have since required expenditure upon them, which makes them very costly to maintain. The Corporation are at present proceeding, at an exceedingly slow pace, with the consideration of a proposal by the Engineer and Manager (Mr. W. M'Crae) for the extension of the gas-works. There is no question that the work is necessary; the only trouble is as to how cheaply it can be carried out. The Gas Committee have had several reports from Mr. M'Crae on the subject, and two by Mr. W. Foulis. Caution is a virtue, even in the case of men in charge of public funds; but when it descends to timidity, the virtue loses its savour. This is very nearly what is taking place in Dundee. It is time they were making up their minds on the subject. I fear that they are not being properly led. There is either an absence of someone capable of taking them along with him, or there are so many men who possess this power in about equal degree that they cannot decide who is to do it. It is most probably the latter. It is the fact that, while there are on the Committee several gentlemen of good average business ability, there is no one of outstanding power. The consequence is that public business drags, because no one cares to take the forward step. The Gas Committee have this week again remitted to Mr. Foulis to advise them—and that, too, after having before them plans and estimates by Mr. M'Crae. They seem to want the expert to make up their minds for them, which is going beyond correct public policy. An expert is consulted for the purpose of giving them facts to act upon; and upon his advice they must either proceed or draw back. Mr. M'Crae's proposals involve a very radical alteration of works, as well as additions; but the necessity for his recommendations shows how far Dundee has of late years fallen behind in gas-works construction. The advance has been rapid in other places in such matters as the breaking and conveying of coal, mechanical stoking, and the like—not to speak of oil or water gas plant. None of these are in the Dundee works; and, more than that, the storage accommodation is getting short. Now, if the intention had been to let the works get a little behind, and then, when extensions were necessary, to go in for a large scheme of reconstruction, I could have understood the policy. But this was not the case, because the Corporation have been accustomed to regard their gas-works as second to none—which, by the way, is a very prevalent delusion. They have thus experienced a sort of surprise in the knowledge that their works require a large expenditure to bring them up to date. But, having before them information that this is indubitably the case, their course was clear—to proceed at once with the necessary work. Any other policy would be of the "penny wise and pound foolish" order. There is the greater reason why they should do this, in the fact that the alterations upon the plant and the other improvements, though they will cost money, will effect a saving in the working expenses, and lead to larger profits and cheaper gas. I trust that, when I again refer to this subject, it may be possible for me to state that the Committee have at last screwed themselves up to the "sticking-place," and have resolved to go in for the whole of the work, and not for a part of it, as half measures seldom give satisfaction.

A new gasholder is to be inaugurated at Bo'ness on Monday. It has been built by Messrs. R. & J. Dempster, Limited, of Manchester, at a cost of about £6000, and is of a capacity of 100,000 cubic feet.

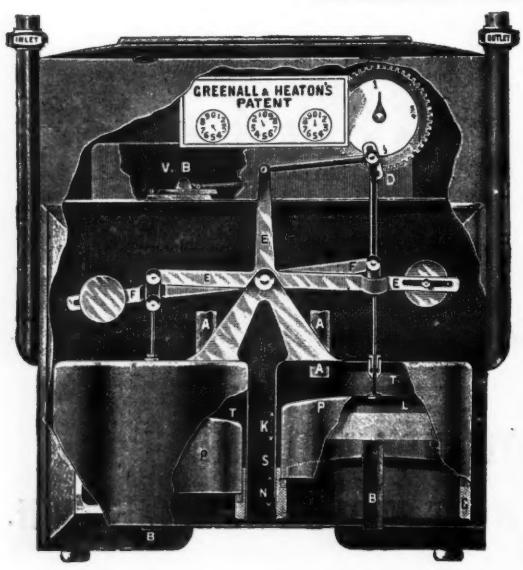
Messrs. John Paterson and Son, Limited, the Contractors for the gasholder-tank at the Temple works of the Glasgow Corporation, lately applied to the Gas Committee for permission to use explosives in blasting the sandstone rock met with in making the sinking. The consideration of the matter was remitted to Mr. R. M. Mitchell, Mr. W. Stevenson, and the Engineer (Mr. W. Foulis). The result of their deliberations has been that they were compelled to deny the privilege; their opinion being that it would be too risky an undertaking, considering the proximity of large gasholders to the new tank.

The Edinburgh and District Water Trustees have to-day lodged

THE "POSITIVE" METER

GREENALL & HEATON'S PATENT.

GLYCERINE has now been adopted for Seal instead of Mercury.



The Object of this Invention is to provide a Meter which will dispense with the use of Water, and will not require Leather in its construction, and which will not be subject to the variations and uncertainties of measurement and working which occur in the Wet and Dry Meters now in general use.

See opposite Page.

answers in the Court of Session to the application by the Clippens Oil Company, Limited, to have the new water-main which the Trustees have laid in a public road at Straiton removed. The Trustees say that the pipe has been laid to the satisfaction of the gentleman appointed by the Court; that it has cost about £5000, and is 2200 yards long; that the Oil Company are not the owners of any lands contiguous, but merely the tenants of the minerals; that none of the owners of the lands have objected to the laying of the pipe; that the Oil Company have been interdicted, at their instance, from working out the limestone below the main for which the new one is substituted, or within 40 yards of it; that, notwithstanding the interdict, there is great risk of injury to the old main; that if a breakage were to occur in it, and the new pipe were removed, there would be a water famine in an area inhabited by a population of nearly 400,000; and that in the Bill which the Trustees are promoting in Parliament, they are willing to insert a clause providing that the new main shall not be used in any way unless in the event of the old one breaking down. They are also prepared to pay whatever compensation the Oil Company may by arbitration be found entitled to. They ask, therefore, that the pipe be not ordered to be removed, but that the application should be allowed to stand over till the issue of the Bill. The case has been sent to the roll for discussion on an early date.

In the Court of Session this week, Lord Stormonth-Darling gave his decision in an action which is of interest to rural local authorities who may contemplate the creation of special lighting districts under the Local Government Act of 1894. In the parish of Castleton in Roxburghshire, there are 45 miles of roads, of which about three-quarters of a mile are in the village of Newcastleton—the only populous place in the whole parish. The Parish Council, or a majority of them, passed a resolution creating the entire parish into a special lighting district; and, in terms of the Act, they obtained authority from the District Committee of the County Council to levy assessments in respect of the lighting. Certain residents in the parish outside Newcastleton brought this action to have the resolutions of the Parish Council and the District Committee set aside, on the ground that they constituted a benefit to the inhabitants of the village at the expense of the rural ratepayers. Lord Stormonth-Darling has given effect to the contention of the pursuers, and reduced the resolutions. In his opinion, the whole parish having been created a special lighting district, it was incumbent on the Parish Council to light the whole 45 miles of roads, which would be absurd. He read section 44 of the statute to mean that the whole of the district was to be lighted, and not a part of it.

The Farnham Rural Water Scheme.—At a recent meeting of the Farnham Rural District Council, the Clerk (Mr. G. Crundwell) reported upon the scheme of water supply for the district for carrying out which parliamentary sanction is to be sought next session, as notified in another part of the "JOURNAL" to-day. It will be seen that all the local Water Companies are concerned in carrying it out; and as it will doubtless be beneficial to the inhabitants of the locality, it received the unanimous support of the Council.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 27.

Sulphate of Ammonia.—The market has been quieter; but a fair amount of business has been passing, and makers' quotations remain at £8 17s. 6d. per ton f.o.b. Hull, and £9 per ton f.o.b. Leith and Liverpool. It is not surprising that the rapid and continuous advance during the preceding three weeks should be followed by a lull. It is true that dealers have been less urgent in "covering;" but they have been quietly picking up any parcels offering, and at full prices. At the same time, they have been quoting abroad, December and January, at a discount, with the object of depressing the market; and they are now offering even near delivery at fully 2s. 6d. per ton under makers' prices. Consumers have bought only moderately. All along they have been encouraged to hang back for the chance of getting in at easier prices. But manifestly they cannot postpone their purchasing for an indefinite period; and, seeing that makers have been able on the advancing market to dispose of their production as it has become available, and to sell some way ahead, it rests with them whether prices shall be allowed to droop. In the forward position, makers are very firm at the advance required a week ago; but no important business is reported thereat.

Nitrate of Soda is firm at 7s. 6d. per cwt. for good, up to 7s. 9d. per cwt. for refined, quality on spot.

LONDON, *Nov.* 27.

Tar Products.—A serious relapse in the value of benzol has taken place during the past week, reflecting itself all through the lighter products of tar. Creosote and tar oils continue firm; but there is no improvement in pitch. A large business is reported in anthracene; and the position of that article is better. There is a fair inquiry for naphthalene, both pressed and drained. Carbolic acid is firm, with a good deal of inquiry.

Business has been done during the week at the following prices: Tar, 14s. to 20s. Pitch, 17s. 6d. to 19s. 6d. Benzols, nominal, 90's, 1s. 8d.; 50's, 1s. 10d. Toluol, 2s. 2d. Solvent naphtha, 1s. 7½d.; Crude, 30 per cent., naphtha, 10d. Creosote, 2¼d.; liquid, 2⅛d. Heavy oils, 40s. to 50s., according to gravity. Carbolic acid, 60's, 2s. 1½d. Naphthalene, 55s.; salts, 27s. 6d. Anthracene, "A," 5½d. to 6d.; "B," 4½d.

Sulphate of Ammonia.—There is a lull in the great activity which has characterized this market for some time. Makers, however, are mostly well sold, and are indifferent to the operations of dealers, who are evidently attempting to depress the article. To-day's value may be taken at £8 15s., less 3½ per cent. at all ports.

Felixstowe Water-Works Purchase Question.—A poll of the ratepayers and owners of Felixstowe has been taken on the question of the proposed purchase of the local water-works by the District Council. The result was a majority of 515 votes in favour of the scheme—708 being for, and 193 against it. There were 182 papers returned blank.

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Mr. C. BUCKLEY, Official Meter Tester, Leeds, *re* recent test, says: "The lights were perfectly steady at 2-10ths; the Meter continued to work after the pressure had been reduced to **half-a-tenth.** The Meter (fitted with 5-light Valves), working at 1-inch pressure, passed 140 feet per hour."

THE "POSITIVE" METER

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COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position here continues not at all satisfactory for the season of the year; and some collieries have not been able to run more than four days per week. Where full time has been kept on, difficulty has been experienced in moving away the output. The better qualities, suitable for house-fire purposes, have perhaps met with rather more inquiry; but they are still plentiful on the market, and full list rates are scarcely being maintained. Common round coals are also plentiful. Prices are weak at about 6s. to 6s. 6d. per ton at the pit for ordinary steam and forge coals; and 7s. 9d. to 8s. for steam coal, delivered at the ports on the Mersey or the Manchester Ship Canal. The present restricted demand for round coal is necessarily lessening the output of slack; and engine fuel is perhaps not quite so plentiful on the market. But supplies are still ample for requirements; and prices are not more than steady at the recent quoted rates. Common sorts average 3s. 3d. to 3s. 6d. per ton at the pit; medium, 3s. 9d. to 4s. 3d.; and best qualities, 4s. 6d. to 4s. 9d.

Northern Coal Trade.—There is lessened activity in the coal trade this week; the non-arrival of steamships making it difficult for some of the collieries to keep fully at work. In the steam coal trade, prices are weaker. Best Northumbrian steam coals are quoted at 8s. per ton f.o.b.; second-class steam, at 7s. 6d. to 7s. 9d.; and steam smalls, at 3s. 3d. The demand for manufacturing coals is weaker; and thus the supply is over-abundant, and the price is easier. Locomotive coal contracts are now under discussion, and seem likely to be renewed at prices not much different to those that prevailed last year. Gas coals are at the period of fullest demand; and the whole of the output is rapidly taken up. For odd cargoes, the price asked is about 8s. per ton f.o.b. There is no alteration in the price of gas coke.

Scotch Coal Trade.—Trade is not quite so steady; but it is still fair. Ell is in good request; and prices keep firm. Main is unchanged. There is a large output of splint—fully larger than the demand—but with unaltered prices. The rates quoted are as follows: Main, 7s. per ton f.o.b. Glasgow; ell, 7s. 6d.; and splint, 7s. 6d. The shipments for the week amounted to 180,300 tons—an increase of 10,259 tons upon the preceding week, and of 51,280 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,300,625 tons—an increase over the same period of last year of 394,480 tons.

The Mayor of Swansea and the Gas Company.—At the first meeting of the new Electric Committee of the Swansea Corporation on the 19th inst., the Mayor (Mr. J. A. Thomas) treated the members to a declaration of his views on their work and policy; and among other matters, he had one or two disrespectful things to say about the Gas Company. In Swansea, he remarked, the only means of public lighting was the Gas Company; and in comparison with towns similarly situated, they obtained about a minimum light at a maximum price. They should, he urged, do what they could to remedy this. The Corporation had the right to erect gas-works of their own to supply the district called the town and franchise of Swansea; and they should make use of it if necessary—at all events, as a lever to get better terms from the Company. If they could acquire the gas undertaking at a reasonable price, he would recommend the Council to do so.

The Winchester Oil-Pipe Dispute.—At the special meeting of the Winchester Town Council on Monday, the 22nd inst., it was reported that an arrangement had been come to with the Gas and Water Company which would put a stop to litigation in regard to the oil-pipe. It may be remembered that the dispute arose from the action of the Company in laying down a large main to convey oil to their works for use in the manufacture of carburetted water gas. The Corporation held—and their view was supported by Counsel's opinion—that this was illegal. The Company, however, obtained an opposite opinion. Legal proceedings were commenced, and proceeded to the stage of the delivery of the briefs, by which time the Corporation's costs amounted to upwards of £40. Mediation then took place; and as a result the Company made the following offer, which had mutual advantages: They would not accept arbitration, which had been suggested, but offered to pay £25 towards the Corporation's costs if all proceedings were stayed. The Company also proposed that the main should be accepted as an accomplished fact, not to be interfered with or called in question. In case of all future openings of the roads, the Company agreed to specify the reason for laying down the pipes. A deed was to be prepared setting forth this agreement. The Council unanimously agreed to accept these terms, and put an end to what promised to be a costly suit.

Misadventure at a Tar-Works.—Last Thursday, an inquest was held at Dublin by the City Coroner (Dr. Kenny) on the body of John Malone, who was found unconscious in a still at the Dublin Tar-Works on the previous Monday, and who died on Wednesday. The Managing Director of the Tar Company (Mr. John Stoer) stated that the still, which was 12 feet in diameter and 12 feet deep, was under repair; and plaintiff was engaged on the work. The still was used for dealing with material received from the gas-works; and the men employed upon it were instructed not to descend into it while it was hot or vapoury. The aniline gave off a heavy gas of the same series as coal gas, but much heavier. It was his opinion that it was perfectly safe to enter the stills when they were cool. He did not think that the still at which Malone had been working was cool on the 22nd inst., although it was opened on the 20th. It generally cooled in two days. While the still was hot the gases were dangerous, but when the still cooled, they became liquid and descended to the bottom. He believed deceased would have been safe had he not fallen to the floor. It was totally unnecessary for the men in the present instance to enter the still; and they had been warned not to do so. Dr. Joy expressed the opinion that deceased died from the effects of gas poisoning on the nerve centres, paralyzing the heart. The blood gave the usual reactions for carbonic oxide poisoning, and also for bisulphide of carbon. Malone did not recover consciousness, and died after 40 hours. The jury returned a verdict of "Accidental death," adding that, in their opinion, a test should in future be made before a workman was permitted to enter even a cool still.

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Illustrated Price Lists on Application.
LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.

Additional Borrowing Powers for the Cheltenham Corporation Water Department.—A special meeting of the Cheltenham Town Council was held yesterday week, to consider a recommendation from the Water Committee with reference to applying for additional borrowing powers. The Committee's report stated that the Borough Engineer had prepared a plan of proposed extensions of works and plant at the Tewkesbury station, the estimated cost of which was £8060, and that the Town Clerk had drawn up a statement of the borrowing powers of the Corporation for the purposes of the water undertaking. It showed that, with the exception of £16, the borrowing powers were exhausted, and that there was only £1953 in hand on account of the moneys raised. The Committee had therefore resolved that application be made to the Local Government Board for a Provisional Order for altering and amending the Water Acts by empowering the Corporation to borrow further sums not exceeding £30,000 in the aggregate. In proposing the adoption of the report, Mr. Margrett enlarged on the increased demands being made upon the town supply, both in Cheltenham and in the surrounding districts, and said it was ultimately intended to improve the Tewkesbury station, so as to make it reliable for a yield of a million gallons a day at all times. The report was adopted.

Relics of Liverpool's Ancient Water Supply.—Some water-pipes made from trunks of trees having been dug up in one of the streets of Liverpool, a correspondent sent to one of the papers the following particulars in regard to the ancient water supply of the city: "About the year 1695, certain London speculators—Messrs. Barry, Tuttle, and Green—were granted a lease for the conveyance of fresh water from Rimrose Brook, Boole, to Liverpool. After ten years' delay, they had not fulfilled the terms of their lease. These are not exactly known, neither is the date; the lease being lost. On the 7th of November, 1705, this lease was rescinded, and the scheme was taken up by Sir Clare Moore, of Bank Hall, to whom the grant was made for 100 years; he engaging to carry out the works in three years. After many difficulties and delays, this was completed, and the water-pipes made from tree trunks, were then laid down. These are for the most part beech trees—a timber well calculated to endure in water. The bore of the larger pipes is 6 inches, and a smaller size was used of 4½-inch bore. How long this general system remained in use I am unable at present to say, but it is within my own memory that in certain streets, which were about the year 1829 suburban, some of these wooden pipes were in use, and were then replaced by iron ones of about 6 inches bore. Great care was taken in these streets to relieve the pressure repeatedly by drawing the plugs."

Additional Storage for the Tonbridge Water-Works.—The Contractors for the new reservoir which the Tonbridge Water Company a short time ago put in hand to meet the requirements of their district, have made such progress with the work that it was almost ready to be covered in when a visit of inspection was recently paid by the Chairman of the Company (Mr. J. Fagg), who was accompanied by members of the Board and several local officials, including the Manager (Mr. J. Lees). Mr. Fagg explained that the work now being carried out was only a repetition of what had been done several times during the last ten years—notably the closing of the old open reservoir and the opening of a new covered one with a capacity of half a million gallons. During the recent dry season, the Directors again had the matter under their consideration; and, in view of the increase in the population, they arrived at the determination to enlarge their storage reservoir. He bore high testimony to the work of Mr. Lees, who had, he said, by his interest in the Company and his philosophic enterprise, brought about many alterations which the Directors believed would realize all their expectations. A row of lime trees was planted on the south bank of the reservoir, in commemoration of Her Majesty's Record Reign; Mr. Fagg placing the first tree in position, and being followed by the other Directors. The event was celebrated by a dinner to the Contractors (Messrs. R. Langridge and Son) and the whole of the men employed on the reservoir.

A New Gas-Works Loan at Wigan.—At a recent meeting of the Gas and Electric Lighting Committee of the Wigan Corporation, it was resolved that the Council be recommended to apply for additional borrowing powers to the extent of £20,000 for gas-works purposes.

The Nottingham Corporation and the Water Supply of West Bridgford.—At the last monthly meeting of the West Bridgford District Council, the Water Committee presented a report, in the course of which they recommended that, in view of the constantly recurring difficulty in getting the Nottingham Corporation to extend their water-mains in West Bridgford, the Council should avail themselves of their legal powers and their enabling agreements with the Corporation, for the purpose of acquiring and constructing local water-works; and that application should be made to the Local Government Board for their sanction to a loan of £20,000 for the purpose—the works to be designed by Mr. W. H. Radford, for the supply of the town only, and to be ample for a population of 10,000 persons. The motion was carried, with four dissentients.

Heywood Corporation Water Supply.—Last Wednesday, the Heywood Town Council held a special meeting, for the purpose of taking into consideration the expediency of introducing in Parliament a Bill to extend the time for the construction of a reservoir at Ashworth Moor and also to authorize the Corporation to borrow money for other water-works purposes. Mr. S. Firth, the Chairman of the Water Committee, in moving a formal resolution that the Corporation promote the Bill, said in 1877 they obtained powers to construct a reservoir at Ashworth Moor. The time allowed was twelve years; but in 1889 the Corporation applied to Parliament for a further extension, and an additional period of ten years was granted. This time was now about to elapse; and it was necessary that another Bill should be promoted so that the scheme could be proceeded with. Since the date that Parliament granted powers to the Corporation to construct the reservoir, a quantity of land had been purchased; but the Corporation had delayed the construction of the lodge as there had not been up to recently any immediate necessity for it. They had had no wish to spend a large amount of money; but the increase in the consumption of water had been so great during the last few years that it had now become imperative that the Council should provide more water. It was, therefore, necessary that an extension of time should be obtained; so that the Ashworth Moor scheme could be proceeded with. The resolution was carried by a unanimous vote.

Messrs. Ashmore, Benson, Pease, and Co., Limited, have removed their London offices from Westminster to 181, Queen Victoria Street. Their interests in the Metropolis are in future to be looked after by Mr. J. Wright, M.Inst.M.E., who for the past twenty-one years has been intimately associated with the management of the works at Stockton-on-Tees.

By an announcement which appears in another column, our readers will see that the Barton-upon-Humber Water Company, Limited, are inviting tenders for 800 ordinary and 600 cumulative preference shares of £10 each; the former ranking for dividend up to 10 per cent., and the latter bearing interest at 6 per cent. per annum. The Company obtained their powers by a Provisional Order granted last session; and they are authorized to supply water in Barton-upon-Humber, Barrow, and Goxhill, in Lincolnshire.

The property and assets of the Belgrano Gas Company having been sold to the River Plate Gas Company, the latter, who have agreed to pay and discharge all the liabilities of the Belgrano Company, intend, out of the moneys to be provided for the purpose by the former, to pay off the £100,000 of 5 per cent. debenture stock on the 1st of July, 1898. Holders of the 5 per cent. debenture stock who have not converted the same into the recent issue of £250,000 of 4 per cent. debenture stock of the River Plate Gas Company will therefore be repaid £110 for each £100 of stock, and so in proportion for any greater or less amount.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095. Holborn.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

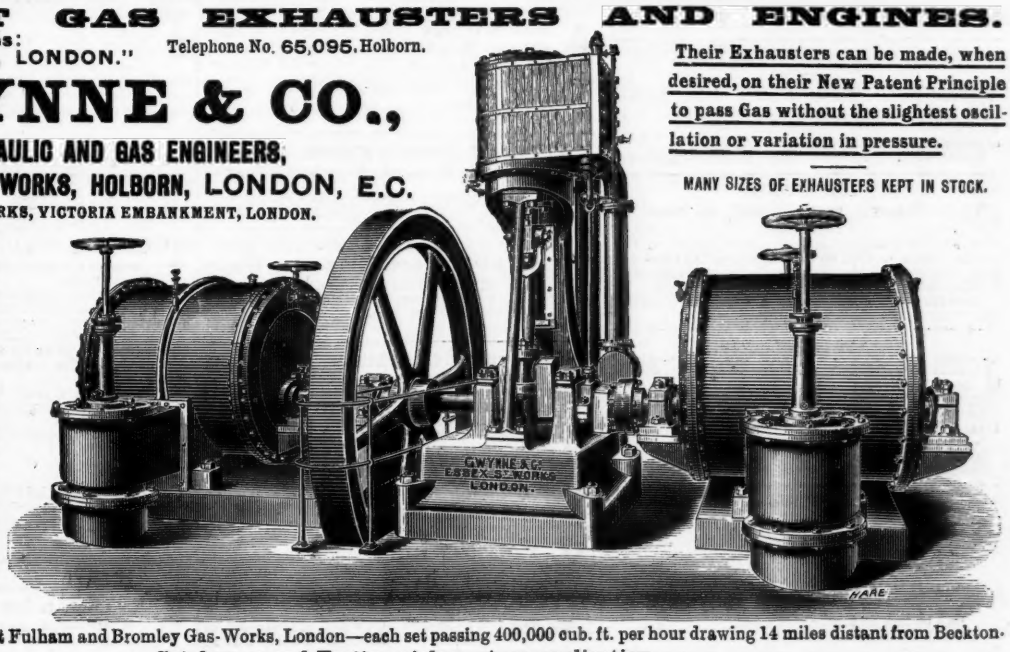
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 35,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.
ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.
Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.
BROTHERTON AND CO, Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

TO GAS AND WATER OFFICIALS.
DON'T forget to Order your 1898 Cycle from the MELROSE CYCLE COMPANY, COVENTRY.

TUBES for Gas, Steam, and Water (all Sizes) Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c. Tools, and Gas-Works Sundries. (See p. 1034, last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

IMPORTANT.
OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A1." for Mouthpiece Joints. Satisfaction Guaranteed.
CROWTHER, Practical Retort Setter, Manor Street, HUDDERSFIELD.

CANNEL, COAL, ETC.
JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.
JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see Nov. 2, p. 971.]

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "SADLER, MIDDLESBROUGH."

NEW GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

ADVERTISER (age 34), married, seeks a Situation as WORKING MANAGER. Good References.
Address JOSEPH SMITH, 41, Warwick Street, Saltmead, CARDIFF.

TRAVELLER or Correspondent desires an appointment. Accustomed to call on Gas Managers, &c. English, French, and German.
Address No. 2964, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Gas-Fitter. Experienced in Service Laying, Meter Fixing, Index Reading, Stove Fixing, House Fitting (Compo. or Iron). Total Abstainer.
Address A. B., 165, St. Leonard Street, BROMLEY-BY-BOW, E.

A FIRM, with Capital, centrally situated Lancashire and Yorkshire, having good means for Sale of commodities among Steam Users, and Chemical and Gas-Works, are open to take up good AGENCY.
Apply, by letter, to No. 2970, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GAS-WORKS Manager now abroad wishes to place his Son (age 17), who has been educated in England, as PUPIL with a Gas Engineer of established reputation in this Country.
State Particulars, Premium required, &c., in confidence, to No. 2967, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Manager wanted. Must be thoroughly reliable, and produce best References as to Character.
State, by letter, lowest Wages required to No. 2969, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CANTERBURY GAS AND WATER COMPANY.
WANTED, a competent Gas-Works FITTER, for Main and Service Laying, and Slot Meter and Stove Work. Wages, 30s. per week.
Apply, by letter, stating Age, and whether married or single, to the MANAGER, Gas-Works, CANTERBURY.

THE Ennis Gas Consumers' Company, Limited, require the services of a Man as MANAGER and GAS-FITTER. Must be a good Carbonizer, Layer of Mains and Services, and understand Gas-Engine and Exhauster. Salary 30s. per week, House, Fuel, and Light free. Send Testimonials with applications.
Address the SECRETARY, Gas-Works, Ennis, Co. CLARE.

BURTON LATIMER GAS COMPANY, LIMITED.
WANTED, immediately, a Working MANAGER. Must have a thorough knowledge of Gas Making, and its Distribution. One who is a Fitter preferred. Make of Gas, 2 Millions a year. House, Light, and Fire provided.
Applications, with Testimonials, stating Age and Wages required, to be sent in by Dec. 6, addressed to Mr. F. T. FREESTONE, Alexandra Street, Burton Latimer, near KETTERING.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.
BALE & CO.'S Oxide of uniform quality
SPECIAL FIRE CEMENT, OXIDE PAINTS OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E., and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

WANTED, immediately, in the Provinces, a leading DRAUGHTSMAN, used to Gas-Furnace Work. State Age and Salary expected.
Apply, by letter, to No. 2968, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF MOSSLEY.

THE Gas and Lighting Committee are prepared to receive applications for the appointment of GAS MANAGER at their Works.

The amount of Gas made last Year was 94,300,000 cubic feet; there are 36 miles of Mains in the supply district; and the Retorts are primarily on the Regenerative System.

Applicants must state Age, Qualifications, and Salary required, and must send *copies only* of not less than Three recent Testimonials.

The applications must be sent to the undersigned, endorsed "Gas Manager," not later than the 14th of December next.

JOSEPH HYDE,
Town Clerk.

BOROUGH OF ROTHERHAM.

APPOINTMENT OF GAS ENGINEER.

THE Corporation require immediately the Services of an ENGINEER for their Gas Undertaking.

The Salary will commence at £200 per annum, and will be increased £50 per annum until £300 is reached.

Applications, stating Age, previous Experience, with *copies* of three recent Testimonials, and intimating when the duties can be entered upon, to be sent to the Office of the undersigned not later than Twelve o'clock on Friday, the 3rd day of December next.

Canvassing will disqualify any applicant.

By order,
H. H. HICKMOTT,
Town Clerk.

Town Clerk's Office, Rotherham,
Nov. 24, 1897.

BOROUGH OF ROTHERHAM.

THE Corporation require the services of a CLERK OF WORKS to Superintend the erection of Retort-House and General Gas Extensions.

Applications, stating Age, previous Experience, and Salary required, with *copies* of three Testimonials to be sent to the Office of the undersigned not later than Twelve o'clock on Friday, the 3rd day of December next.

By order,
H. H. HICKMOTT,
Town Clerk.

Town Clerk's Office, Rotherham,
Nov. 24, 1897.

GAS AND WATER WORKS MANAGER.

THE Ambleside Urban District Council require a competent MANAGER for their Gas and Water Works.

The successful Candidate will be required to devote the whole of his time to the duties of his Office, and to keep the Accounts in connection therewith.

The Salary will be £150 per annum; and it is requested that none apply who have not had practical experience in the management of Gas and Water Works.

All applications must be made by letter to the undersigned, enclosing Testimonials, not later than the 30th inst.

Personal canvassing of the members is strictly prohibited.

GEORGE GATEY,
Clerk to the Council.

Ambleside, Nov. 11, 1897.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Bowerby Bridge, YORKS.

WANTED, a few sets of second-hand BRIDLES, SCREWS, and LUGS for Retorts.
Send Particulars and Price free on rail to No. 2966, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED Carbon. State Price for 4-ton Lots, delivered at nearest Station.
Address No. 2960, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—300 14-in. Street-Lanterns, with Cradles, in good condition. Reasonable offers will be considered.
Apply to the ENGINEER and MANAGER, Brentford Gas Company, High Street, BRENTFORD.

FOR SALE — A Modern Sulphate of AMMONIA STILL, built by Messrs. R. & J. Dempster, Manchester, 1893, with separate Liming Compartment. Capacity, with ordinary Liquor, 5000 to 6000 lbs. of Sulphate per day.
For further Particulars, apply to the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

DISUSED Plant for Sale—viz., 500,000 Cubic Feet WALKER'S PATENT PURIFYING MACHINE; Eight PURIFIERS, 12 ft. Square; 250,000 Cubic Feet KIRKHAM, HULETT, and CHANDLER'S WASHER-SCRUBBER; MANN and WALKER'S TOWER SCRUBBER, 5 ft. by 38 ft.
Apply to the GAS-WORKS, HARROGATE.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.
Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Four Strong Wrought-Iron TUBES, 7 ft. by 40 ft.; others down to 2 ft. 4 in. diameter, suitable for Scrubbers, Condensers, and Foul Mains, £5 per ton. CAST PIPES, 10 inches and 14 inches diameter, Faced Flanges, equal to new, with Bends, £4 15s. per ton.
Apply, by letter, to No. 2959, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD, owing to the removal of Works, the following second-hand Materials:—
Four PURIFIERS, 10 ft. by 7 ft. by 3 ft. 6 in., with WROUGHT-IRON COVERS, Lifting Apparatus, Thorncliffe Centre-Valve, and Connections complete.
One Set of CONDENSERS, consisting of 32 8-inch Pipes.
A DONKIN 7-inch Exhauster BYE-PASS VALVE.
One 7000 cubic feet per hour STATION METER, in well-designed square Case, with 8-inch Hydraulic Valve and Bye-Pass. The Drums, Case, and Index are in good condition.
Apply to the MANAGER, Gas-Works, Hitchin, HERTS.

AN APOLOGY.

To the DIRECTORS of "HOLOPHANE" LIMITED, 93, QUEEN VICTORIA STREET, E.C.

I, **W. T. ANDREWS, of 406, Portobello** Road, North Kensington, beg to express my regret for having sold Heybrock's "Opterophane" Globes, made in Infringement of Blondel and Psaroudaki's Patent for "Holophane" Globes No. 19,185 of 1893, which Patent is now the property of your Company. I was not aware that I was infringing your rights. I undertake not to sell any more of such Globes, or any other Globes which may be an Infringement of the said Patent.

Dated the 22nd day of November, 1897.
(Signed) W. T. ANDREWS.

Witness,
BENJAMIN A. ELKIN,
Savoy Mansions, The Savoy, W.C.
Solicitor.

The Directors of "HOLOPHANE" LIMITED, HEREBY GIVE NOTICE that all Persons offering for Sale, or using, Light-Diffusing Globes made in INFRINGEMENT of the Company's Patents WILL BE PROCEEDED AGAINST.

SULPHURIC Acid for Sale B.O.V. and R.O.V. made from Sulphur. Inquiries solicited.
J. HARDMAN, Chemical Works, Milton and Tunstall, STAFFS.

MULLER'S Alpha Gas-Machine (100- Light) FOR SALE. Very good; in working order.
Apply to A. H. STABLE, Esq., The Wells House, MALVERN WELLS.

BROMLEY GAS CONSUMERS' COMPANY.

SALE BY AUCTION OF 400 ORDINARY SHARES OF £10 EACH.

THE Directors give Notice that they have instructed Messrs. BAXTER, PAYNE, and LEPPER to SELL BY AUCTION, at the Bell Hotel, Bromley, Kent, on Thursday, the 16th of December, 1897, at Eight o'clock p.m. precisely, 400 ORDINARY SHARES of £10 each, in the Bromley Gas Consumers' Company, in Lots of Five and Ten Shares.

The Dividend paid upon this class of Shares for the past Six Years, has been at the rate of 8½ per Cent. per Annum.

Particulars and Conditions of Sale may be obtained of the Secretary of the Company; Messrs. Willett and Latter, Solicitors, Bromley, Kent; and of the Auctioneers, Market Square, Bromley, and 69, King William Street, E.C.

By order,
HENRY WILLIAM AMOS,
Secretary.
Bromley, Kent.
Nov. 11, 1897.

TO TAR DISTILLERS.

THE Directors of the Shotley Bridge and Consett District Gas Company invite TENDERS for the purchase of the TAR produced at their Works for the Year 1898.

Quantity, about 60,000 Gallons.

Contractors to provide Barrels, and to accept delivery at Blackhill Station.

Tenders to be sent to the undersigned not later than Dec. 9, 1897.

M. RICHLEY,
Secretary.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCKS and BONDS, WILL BE CLOSED at Four o'clock p.m., on Friday, the 10th prox., for the Half Year ending on the 31st prox., and will be RE-OPENED on the Morning of Saturday, the 11th prox.

The Interest for the Half Year will be payable, on the 1st of January next, to the Proprietors registered on the closing of the Books.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.
Chief Office: Horseferry Road,
Westminster, S.W., Nov. 29, 1897.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE BY TENDER OF £10,000 THREE AND A HALF PER CENT. PERPETUAL DEBENTURE STOCK,

MINIMUM PRICE, £118 PER CENT.;

AND OF £15,000 FIVE PER CENT. PREFERENCE STOCK,

MINIMUM PRICE, £160 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £10,000 of THREE AND A HALF PER CENT. PERPETUAL DEBENTURE STOCK and £15,000 FIVE PER CENT. PREFERENCE STOCK, to be issued under the Provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1896.

Particulars and Forms of Tender may be obtained on application to the undersigned; and Tenders must be sent in so as to be received at the Offices of the Company not later than Two o'clock on Tuesday, the 7th of December next.

By order,
THOMAS WADDOM,
Secretary.
Chief Offices; 33, Grainger Street West,
Newcastle-upon-Tyne, Nov. 9, 1897.

Abridged Prospectus.

THE BARTON-UPON-HUMBER WATER COMPANY, LTD.

Empowered by the Barton-upon-Humber Water Order, 1897, confirmed by the Water Orders Confirmation Act, 1897.

Issue of 800 ORDINARY SHARES and 600 SIX PER CENT. CUMULATIVE PREFERENCE SHARES of £10 each.

Under Section 10 of the Company's Order, the Ordinary Shares may rank for Dividends up to 10 per cent., and the Preference Shares to 6 per cent.

Minimum Price of Issue, Par.

TENDERS ARE INVITED, under the Powers of the Barton-upon-Humber Water Order, 1897, and under the terms of a Special Resolution of the Company, duly passed and confirmed, a copy of which accompanies the Prospectus, FOR THE ABOVE SHARES, payable as follows: On application, £10 per cent.; on Monday, the 13th day of December, 1897, 50 per cent. on the amount tendered and accepted; on Monday, the 10th day of January, 1898, balance of amount payable.

The Barton-upon-Humber Water Order, 1897, received Parliamentary sanction on the 6th day of August, 1897; and under that Order, Powers have been obtained to complete the Water-Works for the District.

The Population of Barton, according to the census of 1891, was 5201; and the area of the district 6325 acres. The rateable value, which is yearly increasing, is £20,000. There are many important trades in Barton-upon-Humber. The chief, however, are the new cycle works, malting, brick and tile, cement making, chemical manures, rope, &c. There are also several mills and a brewery.

Barton is situate on the south border of the Humber, six miles south-west from Hull, and twenty miles north-west from Grimsby, and has the advantage of a river frontage. It is in the North Lindsey Division of the County, and is a Petty Sessional Division and County Court District. A branch of the Great Central Railway runs from New Holland Station to Barton, and has a direct communication by that Company's steamboats to Hull. The town is almost entirely supplied by surface wells. The dangerous character of this mode of supply, from a sanitary point of view, is generally recognized. A first-class water supply is only now necessary to further increase the trades and prosperity of the town.

Next in importance to the town of Barton is that of New Holland, situate in the Parish of Barrow-on-Humber. It is the terminus of the Great Central Railway, formerly known as the Manchester, Sheffield, and Lincolnshire Railway. The locomotive and engine works, also the shipping yards of the Railway Company, are situated here. The water in the district, being excessively hard, is unsuitable for locomotive and other trade purposes; but the water to be supplied by the Company will be specially treated by a process of softening, and will therefore be the best soft water procurable

The pumping-station and works, except those necessary for the softening process now being proceeded with, are completed and ready for supplying the town with water. It is estimated that most of the mains, which are being laid, will be completed by next spring, when the works will be officially opened; and the pure and softened water supply so much needed by the inhabitants will be available for their use.

The site of the Water-Works is on elevated land (freehold), about three-quarters of a mile from the town, and includes the Pumping-Station, a Filter-House for the softening and filtering plant, Boiler-House with 10-horse power Engine, Double-Throw Pumps, capable of lifting 10,000 gallons per hour to the Service Reservoir.

The supply of water is obtained from a well 117 feet deep, sunk in the chalk formation, and supplemented by a 12-inch bore-hole in the bottom of the well. The quantity of water thus obtained shows evidence of being fully ample for all requirements. A covered service reservoir containing approximately 200,000 gallons has already been constructed at a sufficiently high elevation to supply the whole of the district, including New Holland, by gravitation.

The water has been analyzed by Mr. Otto Hehner, Public Analyst for Nottinghamshire, West Sussex, &c., who reported on the 8th of September as follows:—

"These two samples are identical in composition; organically they are very pure, and there is no indication of any kind of pollution.

"The hardness is considerable; but as almost three-fourths of the hardness are due to the presence of calcium carbonate (chalk) in solution, there should be no difficulty in softening the supply by the usual means—namely, the addition, carefully regulated, of lime water. After softening, the water would in every way be of admirable quality.

"(Signed) OTTO HEHNER, Public Analyst."

Having regard to the superior quality for both domestic and trade purposes of the Company's supply obtained by the Company's softening process, it is believed that the demand for water in Barton-upon-Humber and other places will be very considerable. The capital being a moderate one, the Directors fully anticipate that when the works are fully developed, after payment of the Preference Interest, the maximum Dividend of 10 per cent. will be paid on the Ordinary Shares. It is estimated that the annual expenses will be small; the works being of so simple a character.

The value of similar water-works investments is illustrated by the present value of the £10 Ordinary Shares in the Great Grimsby Water-Works Company, which are quoted at £21, or equal to a premium of £110 per cent.

Tenders on the Form accompanying the Prospectus, with the required deposit, may be delivered at the Company's Bankers, the York City and County Banking Company, Limited, Head Office, York; Barton-upon-Humber, or other Branches, or their London Agents, Lloyd's Banking Company, Limited, 72, Lombard Street, London, before Twelve o'clock on Friday, the 3rd day of December, 1897, marked "Tenders for Barton-upon-Humber Shares." Tenders at a price including fractions of a shilling other than sixpence will not be preferentially accepted.

Where no allotment is made, the deposit will be returned in full; and in case of a partial allotment, the balance of the deposit will be applied towards the subsequent instalments. If default be made in payment of any instalment at its proper date, the deposit and instalments previously paid will be liable to forfeiture.

A contract has been entered into dated 26th of July, 1897, and made between Mr. E. O. Preston, the Vendor to the Company (who is selling at a profit), of the one part, and the Company of the other part, which may be inspected at the Registered Office of the Company. Resolutions have been passed by the Directors relating to the appointment of a Managing Director, Secretary, and Engineer, which may technically be contracts within Section 33 of the Companies Act, 1867. Tenderers for Shares shall accept the above as notice thereof, and waive all right to any particulars thereof, whether under the said Section or otherwise.

Prospectuses and Forms of Application may be obtained at the York City and County Banking Company, Limited, Head Office, York, Barton-upon-Humber, or other Branches, or from their London Agents, Lloyd's Banking Company, Limited, Lombard Street, E.C.

Water-Works Offices: Barton-upon-Humber, Lincs.

Registered Office: 4, Tokenhouse Buildings, Bank, London.

27th November, 1897.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF £100,000 THREE PER CENT. DEBENTURE STOCK.

MINIMUM PRICE, PAR.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above ISSUE (created under the East London Water-Works Acts of 1894 and 1897), bearing Interest at 3 per cent. per annum, less Income-Tax, and redeemable after the expiration of 25 Years from the date of issue, subject to Six Months' Notice being given by the Company.

Tenders must be delivered at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., not later than Eleven a.m., on Monday, Dec. 13 ensuing.

Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.

By order of the Court of Directors,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place,
Bishopsgate Street, E.C.,
Nov. 18, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars re'ating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
COMMERCIAL GAS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, Tokenhouse Yard, E.C., on Monday, Dec. 6, 1897, at Two o'clock precisely, in Lots,

£3867 of NEW STOCK,

Ranking for a Standard Dividend of 7 per cent., subject to the Sliding-Scale, the last Dividend on the Company's New Stock having been 10½ per cent.; also

£2358 of FOUR AND A HALF PER CENT. PERPETUAL DEBENTURE STOCK OF THE COMMERCIAL GAS COMPANY.

Particulars may be obtained of the SECRETARY of the Company, at their Offices, Ben Jonson Road, STEPNEY, E., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

ISSUE OF £4250 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Monday, Dec. 6, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

MAIDSTONE GAS COMPANY.

£1770 OF ORDINARY STOCK,

THE LAST DIVIDEND ON WHICH WAS ELEVEN PER CENT. PER ANNUM.

MR. ALFRED RICHARDS will Sell the above BY AUCTION at the Mart, E.C., on Monday, Dec. 6, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.
200 SHARES IN THE
WORTHING GASLIGHT AND COKE COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Monday, Dec. 6, at Two o'clock, in Lots.

200 £10 FULLY-PAID SHARES

in the above Undertaking, ranking for a Standard Dividend of 7 per cent. per annum; the last Dividend on similar Shares in the Company having been at this rate.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
NORTH MIDDLESEX GAS COMPANY.

ISSUE OF £1950 OF DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Monday, Dec. 6, at Two o'clock, in Lots,

£1950 OF FIVE PER CENT. DEBENTURE STOCK of the NORTH MIDDLESEX GAS COMPANY.

Particulars of Messrs. MERRIMAN, PIKE, and MERRIMAN, Solicitors, 25, AUSTIN FRIARS, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

SOUTH-WEST SUBURBAN WATER COMPANY.

£2000 OF 4¼ PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Monday, Dec. 6, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS in respect both to the Four-and-a-Half per Cent. and Three per Cent. DEBENTURE STOCKS WILL BE CLOSED on the 16th of December prox., and RE-OPENED on the 1st of January, 1898.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place,
Bishopsgate, E.C., Nov. 30, 1897.

CHELSEA WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL MEETING of the Governor and Company of Chelsea Water-Works will be held at their Office, Commercial Road, Pimlico, in the County of London, on Thursday, the 16th day of December prox., at One o'clock in the Afternoon precisely, for the General Business of the Company.

The REGISTER of TRANSFERS WILL BE CLOSED between the 4th day of December prox. and the 16th day of December prox., both days inclusive.

By order,
G. H. GILL,
Secretary.

London, Nov. 23, 1897.

Price 7s. 6d., Demy 4to., Limp Cloth.

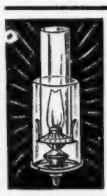
THE FLOW OF GASES AND PROPORTIONING GAS-MAINS

FOUR DIAGRAMS

(WITH EXPLANATORY PAMPHLET)

Invented by F. S. CRIPPS, Assoc.M.Inst.C.E.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.



GAS—NO MORE MANTLES.

BILLING'S NON-MANTLE INCANDESCENT GAS-BURNER. Perfect light and Cheapness combined. 5s. 6d. Complete; Postage, 6d. extra. Lasts a Lifetime. Can be fixed to any existing Gas-Fittings. Gas-Fitters invited to see it; and Agents required.

Offices, where Samples can be seen (ROOM K),
17, GREAT TITCHFIELD STREET, W.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

THE "ETNA" FIRE & HEAT RESISTING CEMENT,

For RETORT PURPOSES, is INVALUABLE.

Sole Manufacturers:
FRED VERITY & SON,
CALL LANE, LEEDS.

Scores of Testimonials received. Write for Particulars.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY
RAVENSTHORPE, NEAR DEWSBURY.

BOLDON GAS COALS

ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Telephone: Castleford No. 214. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."

THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.

ALLERTON BYWATER, CASTLEFORD.

Steam, Manufacturing, & Gas Coals & Cannel.

Analysis, Contracts, Trial Waggons, and Quotations for Large and Small Orders. Inquiries Solicited.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

Lanemark Coal Co.,
LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on Application to

LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad St., E.C.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

For Prices and Particulars, apply to

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THOMAS TURTON AND SONS, Limited,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

HOLMSIDE GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England, and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES, NEWCASTLE-UPON-TYNE.

EVESON FOR CANNEL

Telegrams:
"EVESON, BIRMINGHAM."

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS PURIFICATION BY

HYDRATED OXIDE.

THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.

SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.

MANCHESTER OXIDE COMPANY, LTD.,
CANAL ST., MILES PLATTING, MANCHESTER.

BOGHEAD CANNEL OR TORBANEHILL MINERAL.

JAMES WOOD, LTD.,

Are the only Producers of the famous original

BOGHEAD CANNEL or TORBANEHILL MINERAL.

F.o.b. or c.i.f. Prices on Application to

28, ROYAL EXCHANGE SQUARE, GLASGOW.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke. Maintains a High Standard in Residuals.

THE GRASSMOOR CO., Ld.,

CHESTERFIELD.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub.
Illuminating Power . . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

Coal Owners, Newcastle-on-Tyne:

OR

E. FOSTER & CO.,

21, John Street, Adelphi, London, W.C.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

STOKERS' GLOVES.

GEO. BOULTON & SON, Wholesale Glove Manufacturers, **75, Goswell Rd., London, E.C.**

Will be pleased to send Sample Patterns and Prices to the Managers and Engineers of Gas Companies, similar to those which have been supplied by them to the South Metropolitan Gas Co., The Gaslight and Coke Co., Commercial Gas Co., and others, for 30 years past.

ALL KINDS OF STOUT LEATHER GLOVES for FURNACE or SMELTING WORKS MADE TO ORDER.

WOMBWELL MAIN COMPANY, Ld.

BARNSLEY.

BEST GAS COAL.

ANALYSIS: 11,390 feet of 17-Candle Gas. Value in Sperm per ton, 686 lbs.

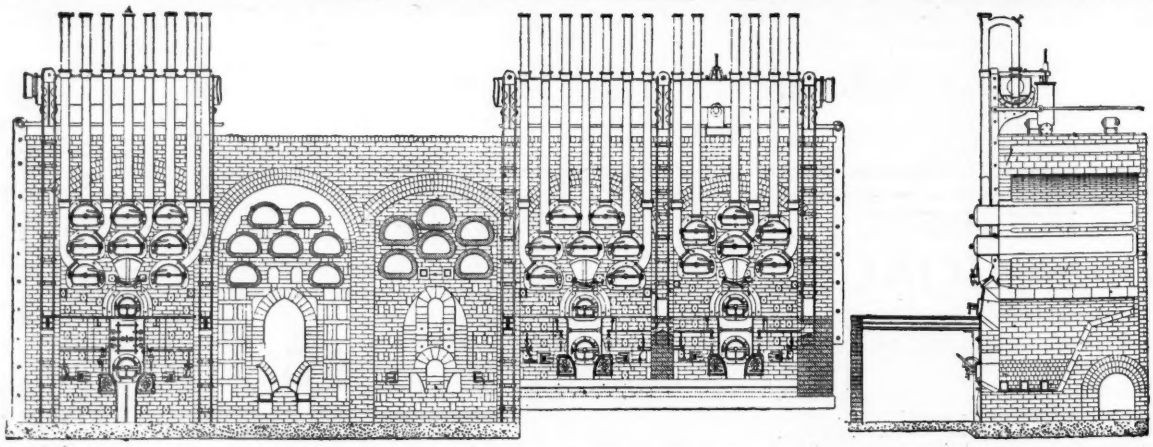
By R. O. PATERSON, C.E.

APPLY

WOMBWELL MAIN COMPANY, LIMITED, BARNSLEY.

Telegrams: "MAIN, WOMBWELL."

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 17 TO 20 CWT. OF ENGLISH AND 20 TO 24 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, Hamilton, Agent for Scotland and Ireland; Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B., and to whom all Inquiries should be addressed in the first instance.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.

Further Information and Pamphlets from Principal Agent.

BRAY'S

"SPECIAL" & "ADJUSTABLE SPECIAL"

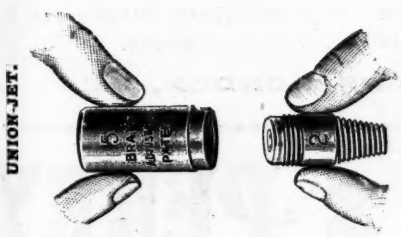
BURNERS.

Suitable for all Pressures and Conditions, are without exception the

GREATEST LIGHT PRODUCERS,

the most Durable, and in the end the

CHEAPEST IN THE WORLD.



Endorsed by the Leading Gas Companies of the World.

SEND FOR CATALOGUE AND PRICE LIST GIVING FURTHER PARTICULARS OF BURNERS MANUFACTURED BY US.

GEO. BRAY & Co.

GAS-LIGHTING ENGINEERS,

Bagby Works, LEEDS.

OXIDE OF IRON.

NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

Wm. H. MÜLLER & CO.,

81, PALMERSTON BUILDINGS, LONDON, E.C.

TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

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LEEDS,

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RETORT LIDS

OF ALL FORMS AND SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

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These Holders are certified by users to be STEADIER UNDER WIND PRESSURE than Holders with Columns.

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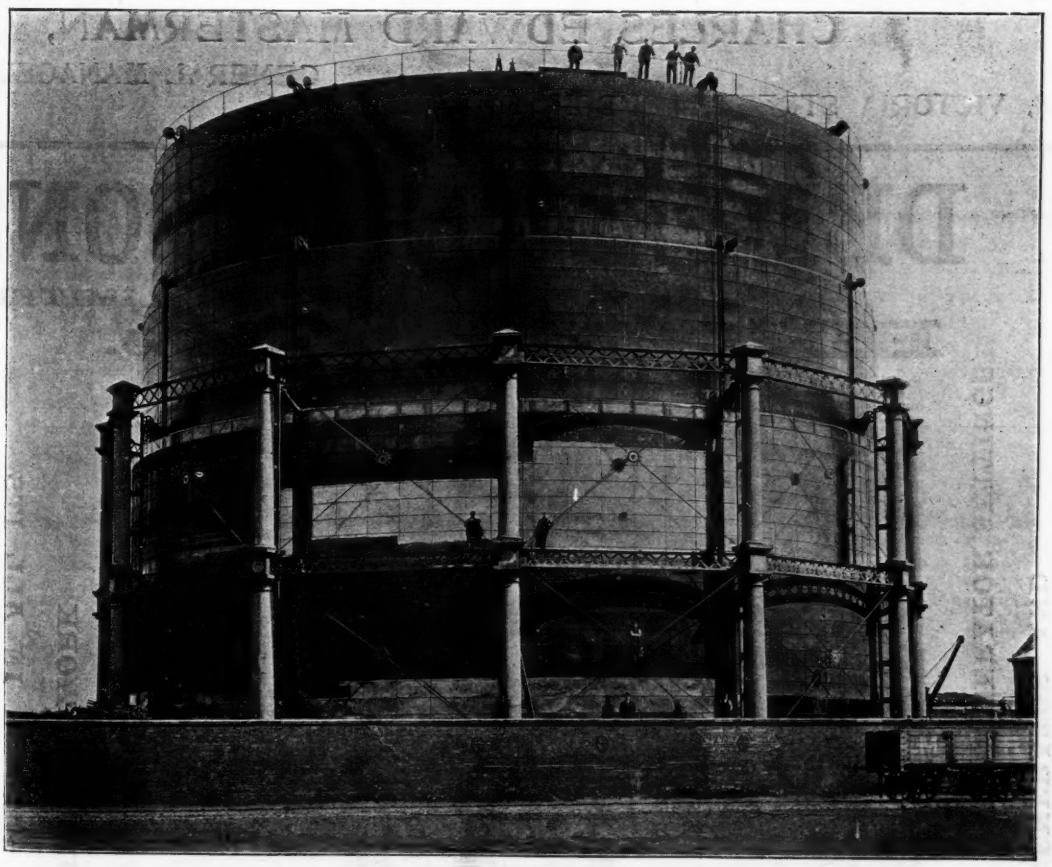

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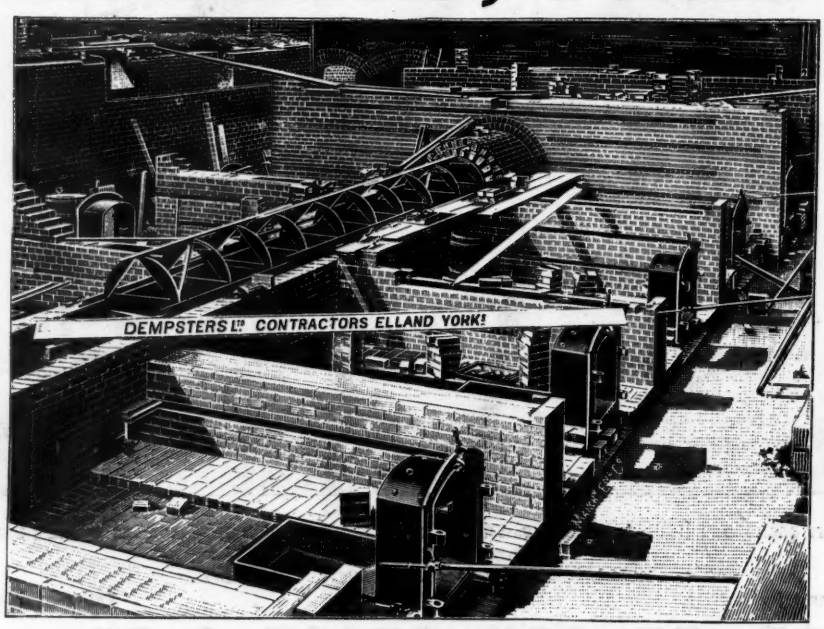

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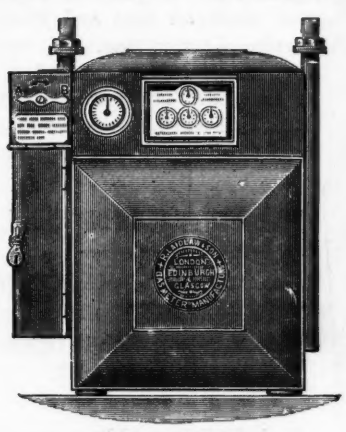

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Lessen liability of Pipes getting Stopped, and facilitate the easy removal of Tarry Deposits. These Pipes can be cleared whilst working without opening the Retort-Door.

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Full Particulars may be obtained from the Sole Makers,
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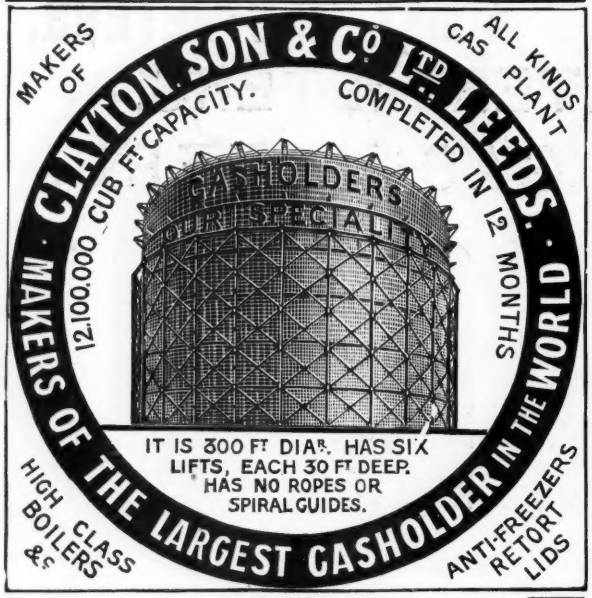
[See Illustrated Advertisement, Nov. 2, p. 973.]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ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
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IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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Fire-Bricks, Lumps, Tiles, &c., &c., of ever description suitable for Gas-Works.

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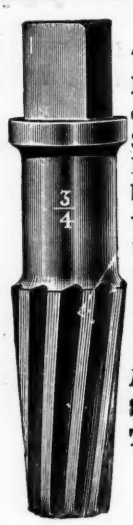

These **Patent Twisted Taper Rymers and Taps** are the best ever made for Gas and Water Service Connections. A true Hole and a correct Thread can be assured. They are easy to work, and will last much longer than straight grooved Taps and Rymers.

THOUSANDS ARE IN DAILY USE.

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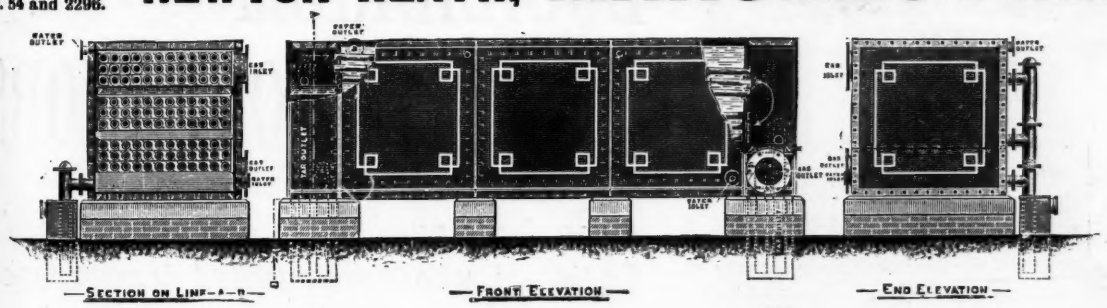

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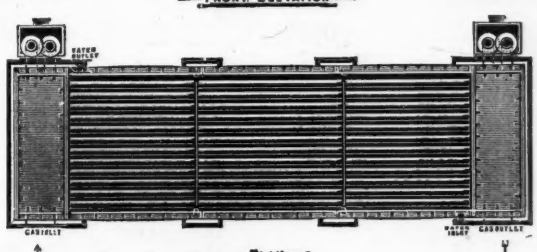

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[See also Advt. p. 1158.

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